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Well-Ordered Plant First Step in Securing Increased Business

A year ago it was stated in these columns that the telephone industry is not subject to the fluctuations which disturb most lines of business in times of depression. However, the adverse conditions, from which not only this country but practically the whole civilized world is emerging, have been so severe that normal telephone growth has had a temporary setback. In order to restore normal growth a real selling effort is needed.

This has been the keynote at all the state association conventions held so far this year; all have "gone commercial." Diligent sales work on the part of the commercial, plant and traffic departments is necessary to insure increased earnings. But this can be carried out to best advantage only when plant equipment is in good working order. Time and time again it has been proved that people are willing to pay considerably more for improved telephone service, if convinced of its value through exercise of salesmanship.

* * * *

The unusually mild winter with the accompanying small damage, comparatively speaking, to telephone lines, makes easier the job of checking every bit of outside plant equipment. Construction work can, in most sections of the country, proceed without the expensive and time-consuming job of rebuilding lines disabled because of sleet storms and floods.

Reports from the field indicate that in many instances large sums will be spent on rebuilding old lines and in extending telephone service. One of the important Independent systems plans a $4,000,000 budget for 1931—and this provides only for those companies in but one part of its territory. It is stated that this represents a substantial increase over the 1930 budget.

* * * *

The small telephone companies, especially those having a large rural development, are face to face with a wonderful opportunity. Commodity prices are down to a level making possible the production of facilities for the sale of a better class of service and justifying higher rates. As Secretary MacKinnon of the Kansas Telephone Association says:

"This period is really a God-send to most of us, for we are back where we started in 1906 with prices coming down to our level. Are we going to sit still and take our medicine again for another 25 years, or are we going to start selling a new type of service that will place our business on a sound foundation?

* * * *

"Raises in rates for our present service are out of the question, for we would be simply turning on a shower of grief and poor public relations if we tried to use that method. People are not in the mood to pay more money for the same article they have been buying for years during a time when their own products and the value of their own services are on the down grade. But it has been proved they will pay more money for something new!"

Metallic rural service is something new for some exchanges, particularly in the plains states west of the Mississippi River. Others are considering the substitution of common battery equipment for magneto. In still other cases, inter-city circuits, also called trunk and toll circuits, are being replaced, thus providing better transmission and inspiring quicker service.

The great activity in road building during recent years will continue and cause the removal of thousands of telephone poles. This is a kind of construction work which is naturally distasteful as it carries no increased revenues for the companies affected. Nevertheless, it is necessary and in most cases furnishes a good excuse for rebuilding wornout lines.

* * * *

Secretary Thos. Phalen of the South Dakota Telephone Association reports:

"The state highway commission is planning on an extensive highway building program during the coming summer which no doubt will necessitate moving many miles of rural and toll pole lines located on the highways to be improved. This will result in some cases in rebuilding the pole lines located on these highways."

Every one seems to be agreed on the thought that the best way to hasten the return of prosperity is to keep unemployment at a minimum. The telephone industry has cooperated toward this end during the past year. And this year it is going ahead with construction work that will re-

sult in adequate facilities to meet not only the present demand for telephone service, but also to meet the demands that are sure to come in the immediate future.

The Human Element.

Naturally, the annual report of a corporation having five billion dollars' worth of assets is an important document, and the information contained in the 1930 report of the American Telephone & Telegraph Co. is of wide interest to telephone men. But entirely aside from the imposing statistics presented, there is more real human interest in the short paragraph that concludes the report. In it President Walter S. Gifford says:

"Although not appearing on the balance sheet, the greatest asset of the Bell System is the skill, energy and character of the hundreds of thousands of men and women who make up its organization, who have during the past year rendered a more efficient service than ever before."

* * * *

Those who are inclined to doubt the idealism of Big Business may be cynical enough to say that these are mere words, but, nevertheless, there is a fundamental truth in the thought expressed. Corporations may have no souls, but experience shows that the ones which get along best are those fortunate enough to be represented by human beings who conscientiously try to serve the public.

Fat bank balances and growing surpluses are attractive features of financial statements, but the popular reputation of a company depends largely on the spirit of the rank and file of the employes. If their attitude wins the approval of people, the intangible asset of good will created is of inestimable value to any corporation. Being intangible, it finds no place in a balance sheet, but its vital importance to a telephone company cannot be measured.

COMING CONVENTIONS

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, April 7, 8 and 9.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 15, 16 and 17.

United States Independent Telephone Association, Southern District, Sheraton Hotel, High Point, N. C., April 22, 23 and 24.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 6 and 7.

Arkansas Telephone Association, Arlington Hotel, Hot Springs, May 14 and 15.

Up-State Telephone Association of New York, Seneca Hotel, Rochester, May 20 and 21.

Pennsylvania State Telephone & Traffic Association, Hotel Penn Harris, Harrisburg, May 26, 27 and 28.

Kansas Telephone Association, The Sunflower Hotel, Abilene, June 2, 3 and 4.

Buried Tape-Armored Exchange Cable

New Method of Underground Exchange Construction Applicable to Suburban Residential Areas—Method and Materials Used in Burying Tape-Armored Exchange Cable—Cable Placed in Either Hand or Machine-Dug Trench

By C. W. Nystrom,

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The increasing use of the automobile for personal transportation has resulted in the construction of residences in outlying areas to a much greater extent than ever before. Suburban homes are now within the means of the man with a moderate income; and since they are not in congested city areas and usually have larger lots, more thought is being given to the appearance of the property.

Trees, flower beds and ornamental shrubs are provided; and aerial telephone wires and cables are, in some people's minds, not entirely in keeping with their landscaping ideas. The telephone engineer is, accordingly, called on to consider the question of underground plant.

In a suburban residential area, underground service is often quite expensive and in many cases cannot be justified from the telephone company's standpoint. Because of the widely differing conditions encountered, this article deals only with materials and methods and not with the economics of the problem.

Underground distribution is not new, as conduits of various types with small hand holes for splicing and one-pair lead-covered cables carried in iron pipes from the hand-hole to the residences are in common use. It was the high costs of such installations that led to the developments described in this article.

Consideration was first given to the main cable. The successful construction of buried tape-armored toll cables described in the article on "Modern Long Distance Cable Construction" in TELEPHONY of April 5, 1930, indicated the feasibility of using similarly protected exchange cables.

A length of standard 50-pair lead-covered cable was taken to a St. Louis manufacturing plant and covered with a layer of jute roving spirally-wound over the lead sheath. Steel tape was next applied, leaving a space of about ½ inch between adjacent wraps. A second steel tape was placed over the first one so that the space left between the first tape spirals was covered by the second tape. A final covering of jute was then applied. The layers were liberally saturated with an asphalt compound. The several coverings are shown in Fig. 1.

This cable may be placed directly in the earth, and experience so far has shown no effect of soil corrosion on the lead cable sheath. Cables in the sizes and gauges ordinarily required for exchange use and having protective coverings similar to those just described are now available commercially.

Tape-armored cable can, of course, be

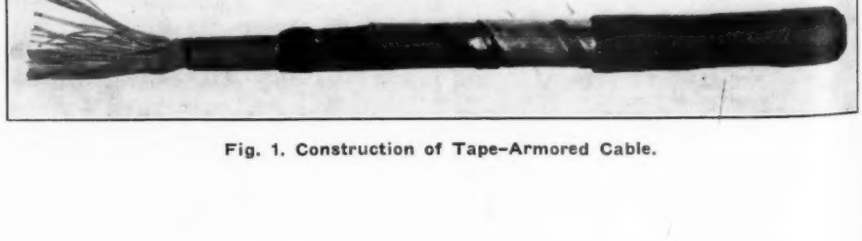


Fig. 1. Construction of Tape-Armored Cable.

Fig. 2. The Cable-Laying Plow—Fig. 3. Laying Tape-Armored Cable with Plow.

placed in a hand or machine-dug trench. In rocky soil, or through highly improved localities containing shrubbery, manual excavating may be required, but this, in any event, is less expensive than for conduit.

The tape-armored cable may be laid to follow the surface contour, and have sharp turns to pass obstacles, while conduit must avoid abrupt changes in grade and small radius curves in order that cable may be pulled into it. Machine-dug trenches for buried cable are no more costly than those for conduit and for the reasons just mentioned may often be less expensive.

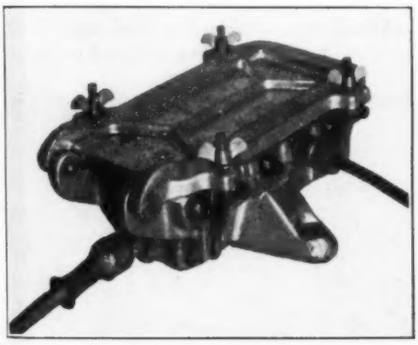


Fig. 4. Underground Terminal Closed. Note Tap Cable Entering Through Stuffing Box.

In order to decrease trenching costs, a plow for laying buried exchange cable was developed. While this plow was referred to in a previous article—TELEPHONY of June 21, 1930—it is again shown in Figs. 2 and 3.

The reel of cable is set up at the point where underground construction is to start, the end of the cable attached to the bottom of the blade of the plow, and the latter pulled along by a medium-sized tractor. The shoe on the lower part of the plow cuts a "mole hole" in the ground, and the cable is pulled into this hole as the plow proceeds.

In very hard soils and in those containing rocks and tree roots, it may be necessary to run the plow through before attaching the cable to it. This preliminary "rooting" operation has made it possible to plow in cable at locations where successful installations seemed, at first, very doubtful.

The plow is relatively inexpensive but the tractor involves quite an investment in a type of equipment that may have only infrequent use. In many localities a tractor can be obtained on a rental basis. The question of purchasing a tractor-plow outfit is obviously one in which consideration must be given to the cost and frequency with which it can be used as compared to other methods of trenching and laying cable.

The time required to place a cable with the plow is short compared to that of digging a trench, laying the cable in it and then backfilling the excavation. One installation of 2,600 feet of buried cable was completed in about three hours. This time included not only the plowing-in of the cable but preliminary rooting, moving and setting up the cable reels every 600 feet, some hand excavating and packing down the disturbed earth.

No backfilling is required as no trench is dug, but the tractor is run over the slot made in the earth by the plow blade. The plowing-in operation itself takes very little time, averaging less than 10 minutes per 600-foot length of cable. The plow will bury the cable to a depth of 26 inches.

Service wires from the main cable to residences may be provided in several ways. A small lead-covered cable containing one or more pairs may be installed in iron pipe or other types of conduit.

Conduits are costly, and there seemed to be no reasons why cable protected by jute and steel tapes should not also be used here as well as for the main cable. However, the need of mechanical protection is not so apparent, and the steel tapes were omitted, the service cable merely having a covering of jute roving thoroughly impregnated with asphalt compound.

It is doubtful whether the steel tapes would afford much protection from a blow by a pick or spade. Of course, a similar line of reasoning might be applied to the main cable, and in this connection some thought is being given to omitting the steel tapes.

As an added precaution against soil corrosion, a layer or two of strip paper applied spirally to the cable sheath before the jute is added may be desirable. Some of the commercial steel tape-armored cables now have paper coverings adjacent to the lead sheath for protection against soil corrosion.

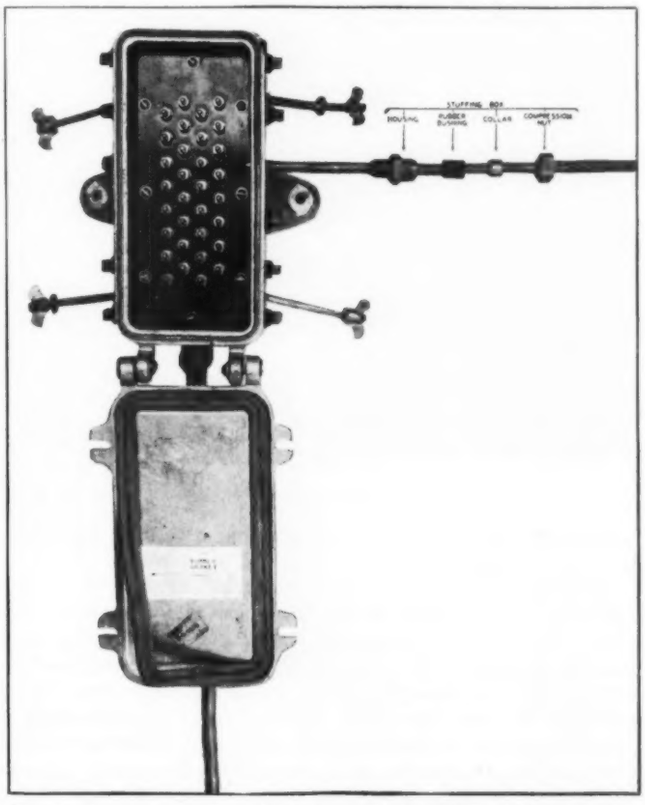


Fig. 5. Underground Terminal Open. Note Detail of Stuffing Box.

Cable plows cannot often be used for installing service tap cables, because of destruction to grass and shrubs by the heavy machinery. Even in the absence of such factors, the short length of cable—usually not over 100 feet—the necessity of hand trenching near the residence, and the placing of tap cables at times other than when the main cable is laid, usually make hand-dug trenches preferable.

If deep-rooted shrubs are present or may reasonably be expected, the cable can be buried to a depth somewhat greater than normal. While added protection will be given by placing a 1-inch by 3-inch creosoted board over the cable, it is not often felt this is needed.

Service cables may be spliced directly into the main cable but the disadvantages of such a plan are fairly obvious. A cable splicer is required for each new installation, for transfers if the main cable pair becomes defective or for pair changes incident to party-line regroupings. Cable terminals seemed necessary, and two methods of housing them were developed.

For below-ground use, the terminal must be water-tight. Figs. 4 and 5 show the type employed. It has the usual stub sealed into the housing back of the face plate carrying the binding posts. A rubber gasket in the lid makes the terminal water-tight when the wing nuts on the clamping bolts are screwed down.

Entrance for the service tap cables is effected by removing one of the brass pipe plugs shown in the photograph. A stuffing box fitting is placed over the tap cable and screwed into the threaded opening left by removing the pipe plug. This stuffing box contains a rubber bushing which is drawn down tightly on the tap cable when the stuffing box assembly is screwed together. The result of the stuffing box use is a water-tight seal between cable and terminal.

Concrete or brick handholes or splicing boxes are expensive, and an appreciable reduction in costs was made possible by boxes built of two-inch creosoted yellow pine. Fig. 6 shows such a box with the terminal in place. Holes are bored in the sides of the box to permit the entrance of tap cables, the holes being so located as to be in line with the pipe plugs or stuffing boxes in the terminals.

Splicing boxes are located at the most convenient points to permit tap cables to be run to the residences. If the main cable is along a rear property line, boxes are usually placed at every other dividing lot line. Thus service to four houses may be given from one terminal.

The terminal stub cable is spliced into the main cable in the usual manner, but the splice is made in the box which affords mechanical protection. In order to guard against soil corrosion, the lead sleeve and portions of cable from which the jute has been removed, are covered with two or three layers of burlap or muslin tape, thoroughly painted with an asphaltum compound.

The box is of three separate parts—bottom, sides and cover. The bottom consists of four pieces of 2-inch by 4-inch lumber, two of which are each 16 inches long, the outside width of the box; the other two are each 24 inches long, the inside length of the box. The longer pieces are placed on top of the shorter ones, the assembly nailed together, and the terminal mounted on the two upper or longitudinal pieces and spliced into the cable.

Crushed stone is placed in the bottom of the excavation to facilitate drainage. The sides and ends of the box are nailed together and the assembly set in place over the terminal, splice and main cable. Vertical slots in the ends of the box allow the main cable to extend up in the box for a few inches. The height of the box is 12 inches.

For a cover, consideration was first given to the use of creosoted lumber, but this was thought inadvisable for several reasons. The minimum practicable inside width of the box was set at 12 inches, and a cover wide enough to extend the full 14-inch outside width of the box was not readily obtainable in commercial lumber sizes.

It was felt advisable to have the cover flush with the ground surface to permit of ready location and access, but lumber exposed to the weather might warp, become displaced and possibly cause an accident. A wood cover could also readily be removed by children or other unauthorized persons.

A cast-iron top seemed most desirable and Fig. 7 shows one in place. The outer edges are provided with inverted flanges, like the cover of a paper shoe carton, to fit over the box and prevent the entrance of dirt. Projections at the ends of the casting permit ready removal of the cover. The flanges are more clearly pictured in Fig. 6.

While the splicing box and water-tight terminal are satisfactory when all construction must be underground, there are obvious advantages in having the terminal itself above ground.

In many locations where poles and overhead cables and wires cannot be used, the buried cable may be on the rear property line planted with trees or shrubs, and a short pedestal or post for the terminal would not be objectionable. It seemed advisable to enclose the terminal and cables leading up to it, and in Fig. 8 is shown the "Washington Monument" design first used.

Fig. 6. Creosoted Wood Splicing Box Containing Terminal—Fig. 7. Cast Iron Cover for Splicing Box.

Fig. 8. Terminal Pedestal, First Design—Fig. 9. Terminal Pedestal, Second Design.

It was made of No. 14 gauge iron, galvanized after fabrication, and was entirely satisfactory except as to cost. The high price was due to its rectangular cross section and to the taper, requiring four sheets of metal with corner covers brazed to the sides.

The cylindrical design shown in Fig. 9, while possibly not so pleasing, cost only a little over a third as much. Either type may be painted green or any other color to harmonize with surroundings. While Figs. 8 and 9 make the pedestals quite conspicuous, shrubs which have since been planted along the rear property line, quite effectively conceal the pedestals.

Fig. 10 is a view of the pedestal type with the cover removed. The terminal, minus its ordinary cover, is bolted to a four-inch galvanized angle iron, 4½ feet in length, of which the lower three feet extend into the ground.

Since the sheet-iron cover would probably not last very long if placed below the ground line, an iron casting was designed to be bolted to the angle and to support the cover. The center of the casting is open to allow the cables to extend up to the terminal. A bolt extending through the cover and casting holds the cover securely in place but permits its ready removal by a telephone workman.

In Fig. 10 the splice is shown above the ground line. When so located the cable must either be looped up in laying, or cut at each terminal with sufficient "end" left to reach up into the pedestal. This is not feasible when cable is laid with a plow, but there is no particular reason for having the splice above ground if the sleeve and the exposed lead cable sheath are covered with muslin and then painted with asphaltum.

The installations of buried tape armored exchange cable have not been in service long enough to permit of maintenance comparisons with aerial cables on pole lines. It is generally felt that maintenance costs will be appreciably less, for the buried cables are not subject to many of the troubles inherent in aerial plant, such as storms, fires, bullet holes and crosses with electric light wires.

Initial construction costs, while higher than for aerial plant, are quite appreciably

Fig. 10. Terminal Pedestal with Cover Removed.

less than for the ordinary types of underground cables requiring conduit.

It is to be expected that with more experience and further consideration of the problem, improvements in present materials and methods will be brought about. That is one of the principal objectives which prompted the writing of this article.

Why Advertise? Telephone Service a Cooperative Job.

The year 1931 is no time for business men to curtail advertising expenses, if they want to "do any business at all," J. S. McCulloh, president of the New York Telephone Company, told members of the Advertising Club of New York early last month.

Describing the importance of advertising to a proper understanding by the public of the telephone company's business, Mr. McCulloh pointed to the responsibility of advertising men in stimulating a return of prosperity.

"We will not curtail our advertising this year," he said. "Last year we advertised in 450 newspapers in the state, and the telephone groups advertised in 500 magazines and periodicals in the country. We are going to do no less this year."

Telephone officials are asked, Mr. McCulloh said, why they waste money on advertising when their business is in the nature of a monopoly and people have to come to them for service.

Advertising is the "hand-maiden of the telephone service," he asserted, for, with the danger of public misunderstandings of the company's motives and acts, there must be some medium of talking to the public; and the telephone service is really a cooperative job and cannot be effectively carried out without full cooperation of all users.

Chaos would result if the company tried, without full information through advertising, to introduce any necessary major change, such as the dial system or the new numbers, Mr. McCulloh said, expressing appreciation for the cooperation of the press in explaining the new ideas in the news columns.

Advertising is also necessary in explaining company financing, he declared, asserting that automobile men have done a better advertising job than telephone companies, as there are more automobiles on the road than telephones in offices and residences.

The Rehabilitation of Small Exchanges

A Four-Fold Study of Buildings, Central Office Equipment, Distribution and Subscribers' Sets—Simplified Commercial Surveys Necessary—Common Battery Endorsed for Small Exchanges and Rural Systems Under Proper Rates

By Harry N. Faris,

Telephone Consultant and Technical Engineer, The United Telephone Co., Abilene, Kans.

The rehabilitation of small exchanges is an important subject in that one seldom has the opportunity of planning a completely new exchange. So-called "rebuilds" are usually rehabilitations; and it is only in those cases where existing plants have been wholly neglected, until all units call for simultaneous replacement, that one is able to plan an entirely new exchange.

Any rehabilitation requires a four-fold study concerning the adequacy of the present building, central office equipment, outside distribution and subscribers' station equipment.

Commercial Survey Necessary.

Considerations of these four divisions are interdependent, and to secure a proper working basis it is necessary to make such survey as will afford a complete picture of the situation.

Few of the small towns under consideration are growing rapidly. It is, therefore, unnecessary to make the survey elaborate; but present development and facilities should be accurately marked on a combined pole and cable map, while an enlarged sketch of the business district should be made by reference to the insurance risk map.

Residences without telephones should be marked as to good or poor prospects for telephone service. This may be done by general appearances as to paint, etc., taking into account the occupation and financial condition of the occupant, if known. Choice building sites should be marked as such, keeping in mind the general tendency of east frontages to develop first.

Population figures for the past 30 years are available, also population *in families,* which is the unit in which we are most interested. Information as to the number of city telephones is also available for previous years.

When population history in families and the number of telephones are plotted on ratio paper, it is not difficult to estimate the probable number of families and the number of residence and business telephones for any future period up to 20 years. Such estimates must be tempered according to the future outlook and an intimate knowledge of local conditions; but the use of ratio paper showing rate of growth, instead of ordinary section paper showing numerical increase, will aid materially in showing correct trends.

It then remains to determine, as best we can, where the future families will locate, and to provide cables of sufficient size for extension into probable new territory. Such a survey is not only necessary to lay out intelligently a cable distribution system, but the picture of probable future development enables us to pass more intelligently on the building and equipment programs.

Mr. Faris, Veteran Engineer and Practical Telephone Man, Discusses Small Exchange Rehabilitation from Viewpoint of Experience with Various Plants and Equipment and Service Results.

Buildings.

The suitability of present buildings depends on the desired term of usage. If the plant is being rehabilitated as a magneto system, and is to remain magneto for the life of the present central office equipment, the present building should ordinarily be retained. The cables now being placed can be half-tapped, if a new location is desired when the system is changed to common battery.

If the present building is not suitable an effort should be made to procure one that is, both as to location and character, or to erect such a building if finances will permit.

As an adequate and suitable building helps both employe morale and public confidence, every effort should be made to procure one at the proper time. But when necessary to choose between an ideal building and adequate plant and equipment, we should apply the wisdom of the German farmer that "the barn will build the house, but the house won't build the barn."

Enforced reduction in the number of banks in many small towns now offers the telephone company an opportunity to take over a former bank building at a price far below its reproduction cost. Such bargains should be taken advantage of so far as possible.

Occupancy of a former bank building speaks well for the stability of any telephone company. Nor should we hesitate to follow the example of successful banks in putting the operators and equipment in plain sight of the public, leaving no one to wonder what goes on "behind the scenes."

Where a toll operator is a part or full-time attendant, it is preferable to have her at the right of the switchboard, with her uncovered ear toward the toll window and her covered ear toward the other operators. This consideration often justifies a right-to-left growth which, in multiple switchboards, involves no confusion and is readily arranged in the case of non-multiple equipments.

For a complete description of small-town offices the reader is respectfully referred to TELEPHONY of June 28, 1930, which contains a first prize award article on this subject, written by Fred Coulson, Jr., of Salina, Kans.

Central Office Equipment.

Changes in central office equipment should coincide, so far as possible, with new buildings or extensive distribution changes. To move an old switchboard into a new building usually produces an unfavorable public reaction.

Where necessary to move in good equipment, the public should be prepared by advertising the fact that the company did not make the community wait for a new switchboard until the new building could be erected; that the equipment installed in the old office only a few years ago, is still the most suitable type and is to be given a week-end move into the new quarters.

With a new main frame in place and the jumpers run, moving a non-multiple switchboard is never a serious problem, and there is no occasion to import an installation gang in an effort to make such a move in a single night. Two nights and a day is a much more sensible period, and the public will be more appreciative of their telephone service after having been deprived of it, at least over Sunday.

However, no used equipment should be moved into a new building without giving the manufacturer a chance to figure on its replacement. Companies operating a num-

ber of exchanges rarely move a used switchboard into a new office in the same town. They are glad of the opportunity to get the used equipment out of service for a thorough overhauling, in their own or their manufacturers' shops, so it will be reconditioned for the next equipment shift, and available in the meantime for fires or other emergencies. Manufacturers should endeavor to cooperate with single-exchange companies so it will not be necessary for them to move questionable equipment into a new building.

If a new switchboard is to be installed in the present office, it is usually possible to shift the old switchboard temporarily so the new one may be permanently installed in the same ideal location.

Complete overhaulings of old switchboards while in service should be avoided wherever possible. If ordinary maintenance has not sufficed to keep the equipment in satisfactory condition, it can be overhauled and modernized much more thoroughly and economically out of service while being shifted to another exchange.

If there be no other exchange, the manufacturer should so function as to avoid an overhauling in service. Such jobs are expensive, the service is often affected adversely; and, even though everything except the cabinet be changed to the newest and latest type, small-town patrons will continue to think of the switchboard as a "patched-up job." Therefore, a new or completely rehabilitated switchboard should be shipped in and the old board shipped out. This applies to all types of switchboards as used in small exchanges.

Whether or not a magneto switchboard should be replaced with the common battery system depends on the ability of the company and the community to complete the four-fold program of a suitable building, the common battery switchboard, a full metallic distribution system, and the replacement of all magneto telephones in the city with common battery sets having booster-type induction coils.

If there is no question of the company's ability to finance this four-fold program, or of the patrons' ability and willingness to pay for such service, the small size of the exchange need not discourage installing the common battery system.

But the contention of some manufacturers that common battery service is cheaper to render than magneto works out in practice the same as the ever-popular doctrine that "two can live cheaper than one." Any company installing common battery in the belief that savings in operation will render the usual magneto rate adequate, is due for a rude awakening and will find itself headed for rate reform or ruin.

Large magneto exchanges, seeing the four-fold program beyond their reach, often install "universal switchboards." These are, in fact, common battery switchboards with universal line circuits, as well as universal cord circuits, so both common battery and magneto service can be given simultaneously throughout the city exchange.

While perfectly sound from the engineering standpoint, 26 years of actual usage have proved the attempt to give common battery and magneto service simultaneously not advisable from the commercial standpoint. The common battery patrons are not getting full common battery service, but only partial and, as the magneto service is often continued ground return, the common battery patron cannot afford to pay a full common battery rate.

The common battery rate, therefore, is placed at only a nominal amount above the magneto rate. While 60 per cent or 65 per cent of the patrons readily take the common battery service, it is "like pulling teeth" to pry the remainder loose from their "crank" telephones; and when this is accomplished, and the service is all made common battery, it becomes necessary to raise rates on an existing service.

Experience has proved it much wiser to connect the new equipment as a high-class magneto multiple switchboard, and to continue it as such until the preponderance of demand for common battery service results in permission to *abandon* magneto service, provide a full metallic distribution system, and change all city telephones.

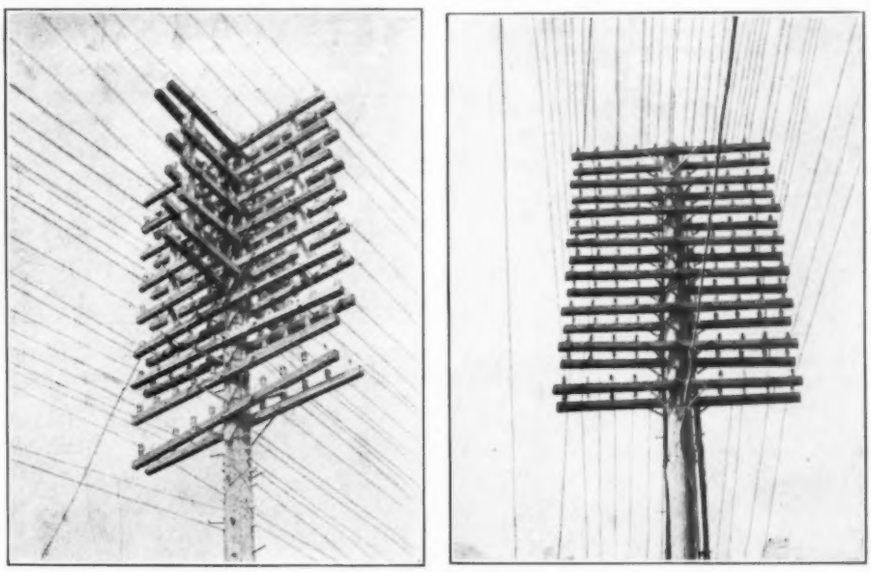
If there is real merit in the claim that a large percentage of users cannot afford individual line residence service, party-line common battery service will be found satisfactory; and it can usually be rendered at an adequate individual line magneto rate.

We believe, therefore, that the universal switchboard has its place as the most sensible type of magneto multiple equipment, but we do believe the conversion to common battery rates and service should be made all at one time.

For smaller exchanges not requiring multiple switchboards, it is safer to stick to magneto equipment until common battery rates can be definitely arranged for. In many exchanges having high-class metallic rural lines it may be found possible to convert the rural system, as well as the city exchange, to common battery. This makes two types of service unnecessary and avoids universal cord circuits in non-toll positions.

Exchanges contemplating an early change to common battery may possibly reduce depreciation on their interim magneto equipment by purchasing a factory rebuilt switchboard. But if the equipment being purchased is for an indefinite period, it will be found profitable to purchase the latest improved type of new equipment.

While it is probable that the number of magneto switchboards in service will steadily decrease, this does not mean that manufacture of such equipment should stop and that all should use rebuilt equipment. The cost of the latter will always bear a percentage relation to the cost of new equipment. The company purchasing rebuilt equipment when it can afford new, is only destroying the manufacturer's mass production, thereby boosting prices on rebuilt equipment to what new equipment would cost if kept on a mass production basis.



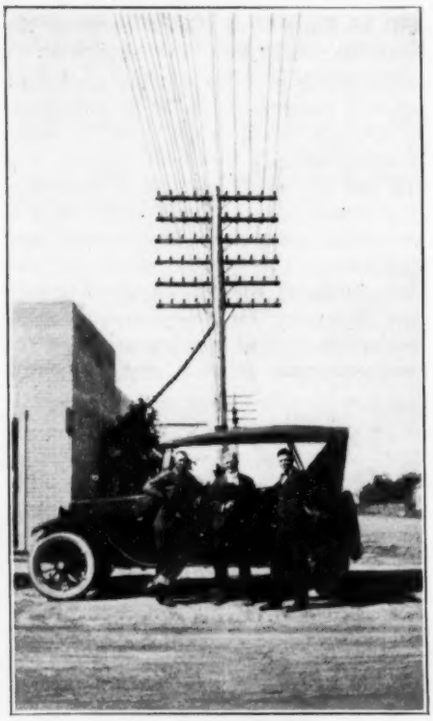
If Rebuilding Is Put Off Too Long, Lines Are "Removed" by Sleet—Improper Rebuilding Follows, for Small Companies Are Forced to Put Up the Same Kind of Construction, as Several Months Are Required to Obtain and Install Cable. This Rebuilt Pole Lead Is Ready for Trouble.

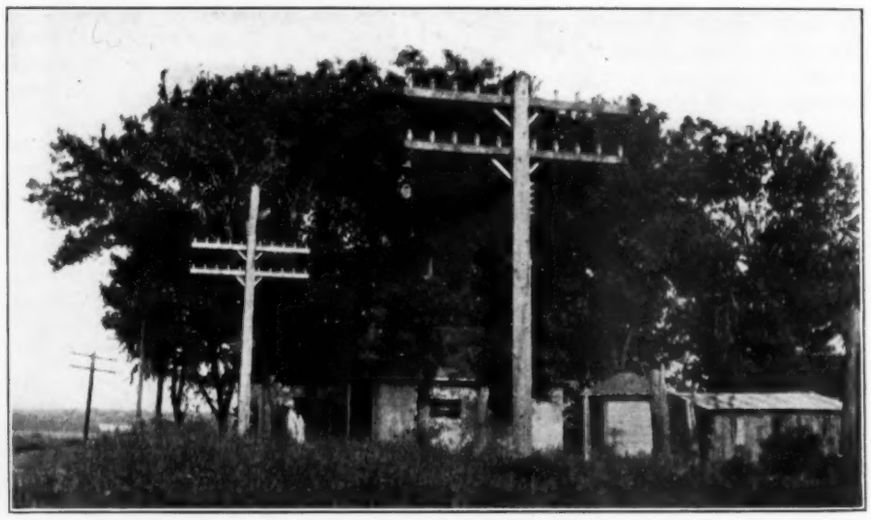
The modern magneto switchboard with non-ring-thru cord circuits and double lamp supervision is a wonderfully-perfected device. On good lines and with good instruments it is capable of rendering fast and satisfactory service. As to traffic speed it is not to be confused with designs of 40 years ago on which magneto traffic figures are too often based.

The vast difference between such equipment and the single-drop supervision switchboard of the past should be brought

to the notice of rate-making bodies. The service rendered by magneto switchboards with double lamp supervision compares favorably with common battery service using negative target supervision and should be entitled to similar rates on full metallic lines.

Small exchanges whose rural patrons exceed city patrons may choose to defer common battery service until it can be made universal in both town and country, but if they are using "super-magneto" equipment, as just described, and are rendering "super-magneto" service, such condition should be reflected in their interim rates.





Well-Maintained Open-Wire Plants May be Allowed to Remain Until the End of Their Useful Life. Small Agency Offices Are Free from Cable Trouble When They Have No Cable.

In fact, it is now recognized that modern magneto equipment should be double supervision with inductively coupled, non-ring-thru cord circuits, and exchanges intending to retain the magneto system should definitely plan to get their equipment on this basis.

The selection of suitable common battery equipment is too large a subject to be treated here. As we are dealing with small exchanges where rural service is relatively important, we should hesitate to "quarantine" the rural magneto equipment and confine it to one or two positions, to be reached only by trunks, but should keep in mind the importance of completing local-to-rural traffic without the aid of the second operator.

It might also be suggested that while machine ringing has become quite popular in small common battery exchanges, an automatic recall is of more value to the patron, and machine ringing should perhaps not be installed without the more beneficial and less expensive automatic recall.

The selection of proper common battery equipment requires the complete cooperation of the telephone company's equipment and traffic superintendents with the manufacturer's engineer, sales strategy being eliminated so far as possible.

Outside Distribution.

A complete discussion of the subject of outside distribution by the writer will be found in TELEPHONY of March 28, 1925, under the title "Practical Independent Plant Plans." Though having laid out distribution systems for some 70 small exchanges since that time, the former recommendations are still good as subsequent general practice has conformed to the trends of that time.

During the present season it has been the writer's privilege to represent the United States Independent Telephone Association at several state conventions in a discussion of the "Coordination of Commercial and Plant Programs." This address is scheduled to appear in a June issue of TELEPHONY. As it will cover the matter of outside distribution with a complete discussion of the party-line question, the reader is urged to consider it, when it appears, in connection with this article. With these references permitted it is possible to shorten the present discussion.

The commercial survey should afford a basis for the quantity of distribution facilities to be provided. Where the outside leads must be completely rebuilt, the company must choose between independent aerial distribution, joint pole lines with the power company, and underground construction with conduit or with asphalt protected "buried" cable.

The present tendency is toward conduit construction for important cable routes and buried cable for alley laterals. Experience has shown that buried cable, without heavy asphaltic protection, is rarely successful and that where necessary to pull asphalt-coated cables under pavement, burlap tape should be used over hot asphalt and the cable re-asphalted to prevent electrolytic contacts between the sheath and the earth or pipe conduit.

The sheath of each section of buried cable should test free from earth contact before being spliced into the cable system. It is advisable not to allow cable sheath to come into contact with main frames grounded to a copper and coke ground at the central office. We believe much trouble could be avoided, in buried cable plants, by using zinc-coated iron grounds which will not establish the high potentials and heavy sheath currents commonly found in copper grounded offices.

In metropolitan districts, joint pole distribution is decreasing in favor. This is due to the increasing use of 6,600 and 13,200 volts for distribution in place of the former 2,300 and 4,400 volts. As these higher potentials are not likely to be used for distribution in smaller towns, joint pole construction should be considered seriously before cluttering up streets and alleys with two pole lines, when rocky soil or other considerations render underground construction impractical.

A well-built, long-life aerial plant is very expensive to construct, and the added investment and extra poles should not be imposed on the public when the power company can be worked with on a reasonable basis. But an underground plant with buried cable laterals should be first choice when practicable.

Independent telephone companies are gradually learning to use unprotected cable terminals, and plenty of them, in place of their former practice of one protected terminal per block. Even the end terminal need no longer be of the protected type, for the use of a ten-point protector per crossarm, through which the bridle wires may be *looped* uncut, affords adequate pro-

tection except in cases of unusual exposure. The improbability of trolley current invading communities now without interurban railways should be taken into account in planning small exchange protection.

Subscribers' Station Equipment.

When considering changes to common battery, magneto exchanges often receive tempting offers to trade in their old magneto sets on rebuilt common battery sets. Such propositions should not be considered unless the offered sets have real booster type induction coils and are wired with the standard booster circuit.

There has been but one *local battery* talking circuit since the introduction of the variable resistance transmitter, more than 50 years ago; but since the advent of the common battery system, in the late '90s, no less than ten distinct common battery circuits have come into extensive usage.

It is now generally recognized that of these various systems only the booster type induction coil circuits can be considered. If the telephones offered are so equipped, and are provided with new transmitters and good funnel cap receivers, they need not be rejected because they are of the exposed gong type.

But booster type common battery telephones are in such demand *for cash,* that most companies offered trades will find the common battery sets to have direct-current receivers, or retardation coils, or non-booster local secondary induction coils. For this reason, *new* telephones must usually be included in conversion estimates, and only a small amount of net salvage figured for the displaced magneto sets.

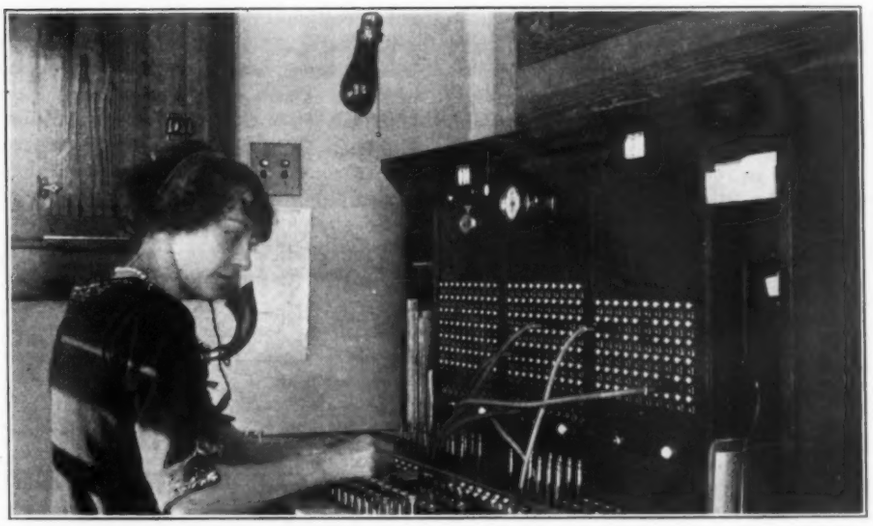
If the plant being rehabilitated is already common battery, with non-standard subscriber sets, some means should be found to replace the latter, or to shop equip them with standard, booster type induction coil circuits.

Common battery rural sets, arranged to ring to ground, must not only be of the booster type but must have separate condensers for ringing and talking to avoid excessive loss of battery supply to the transmitter. Lack of this second condenser in ring-to-ground sets, is only one reason why common battery rural service is not more extensively used.

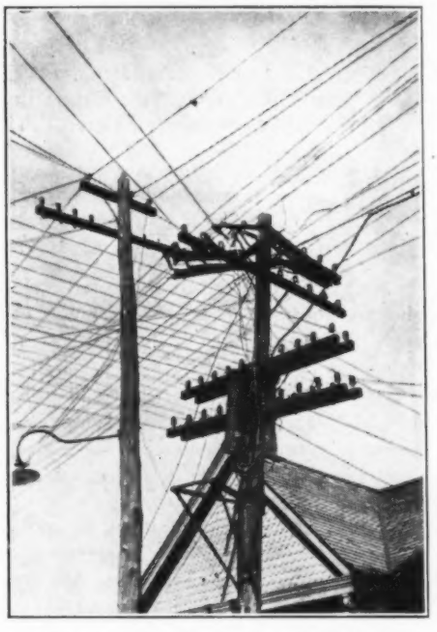
In magneto systems, too many rehabilitations stop short of the subscribers' telephones. The entire program does not bring proper results unless the telephone itself is tested by a competent instrument man, and deficient parts replaced, and the circuit must often be restored to standard. The latter is likely to be necessary if the induction coil, or a three-point generator, has ever been changed.

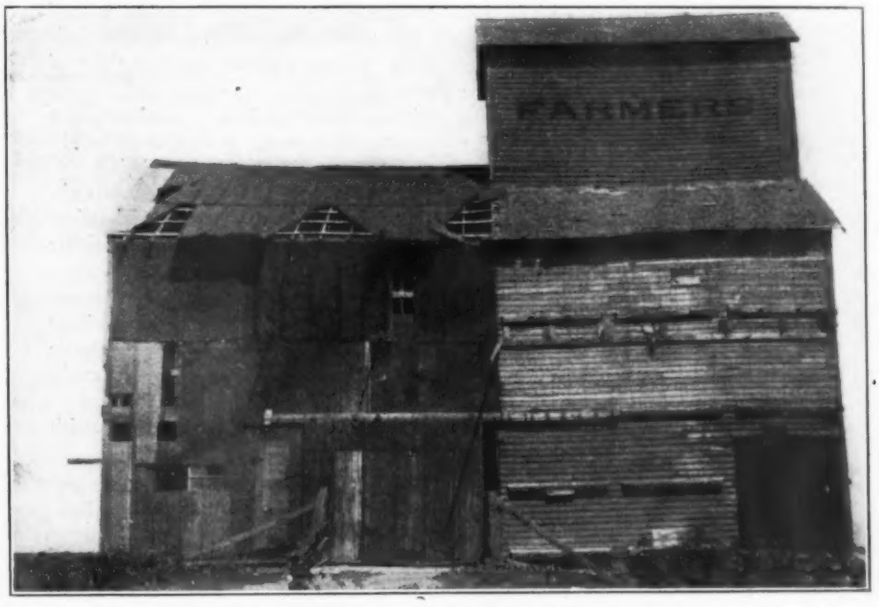
A careful inspection of old magneto subscriber sets rarely fails to reveal all kinds of irregularities. No two manufacturers arrange primary and secondary induction coil terminals in the same manner, and coil replacements in "orphan" sets result in a high percentage of errors. Coils are connected "wrong end to," or with terminals so mixed as to wholly defeat the induction coil's function; yet these subscriber sets remain in service for years.

But the confusion found in magneto wall sets is nothing compared with that in magneto desk sets, where the indiscriminate use of three, four and five-conductor cords and of mixed number and color systems has rendered it almost im-



Telephone Switchboard with 200 Common Battery Lines Furnishing Service to a Progressive Nebraska Village. When the Old Plant and Equipment Require Simultaneous Replacement, More Offices of This Type Should be Installed.





Two Rural Problems: The Organizations Operating These Two Plants Have Practically the Same Men as Directors on Their Boards. Would Not the Big Job of Crop Marketing Have Been Better Done Had It Been Given Full Attention and the Telephone Business Left to Telephone People? Can Those Men of the Farmers' Crop-Marketing Organization Who Failed to Maintain a Competitive Elevator Be Trusted to Maintain a Non-Competitive Telephone Service?

possible for the ordinary troubleman to keep stands and boxes properly paired and cords properly connected.

This matter of mis-hitched desk sets is so largely responsible for transmission complaints that it was made the subject of a special article in TELEPHONY of May 11, 1929, entitled "Standardization of Magneto Desk Sets." In this we stressed the importance of plainly designating both stands and boxes, citing that the simplest three-conductor cord used on magneto desk sets can be connected in six different ways. The startling thing is that while only one of the six possible methods is right, only one is wholly inoperative. This leaves the chances five to one that a random hitch will not be correctly made.

Reprints of this article are still available, on application to the writer, for those desiring complete information on the subject or desiring to establish repair shop practices for the rehabilitation of existing mixed equipment.

In conclusion, it is necessary to emphasize that the small company with an organization amply sufficient to *maintain* a telephone plant should not attempt an extensive *rebuilding* with only its local maintenance organization. On the completion of a well-executed rebuilding job, with skilled outside assistance, the really competent local man is able to go out and do a similar job himself. He has modernized his telephone knowledge and experience and rendered himself more competent than he would be had he "messed up" a rebuild by over-reaching his own experience.

Although the science of architecture is perhaps 100 times as old as that of telephony, no one undertakes the erection of a building—or extensive remodeling of an old one—without the planning and supervisory services of a competent architect.

As the telephone managements of the smaller exchanges come to realize the need of a competent "telephone architect" for plans and supervision of their important undertakings, their service will improve in quality, their regular help will become more efficient, their maintenance costs will go down and a satisfactory profit margin will be shown.

Good Program Arranged for Iowa Convention in Des Moines.

A splendid program has been arranged for the 36th annual convention of the Iowa Independent Telephone Association, to be held at Hotel Fort Des Moines, Des Moines, Iowa, Tuesday, Wednesday and Thursday, April 7, 8 and 9. General sessions are planned for Tuesday and Wednesday and conferences for Thursday.

A plant men's school will be conduced by Lester D. Meyers, superintendent, Boyer Valley Telephone Co., Woodbine; the commercial employes' conference by Joseph R. Denkhoff, secretary, Iowa Telephone & Telegraph Co., Dyersville, and the traffic conference by Miss Anne Barnes, traveling chief operator, Iowa Independent Telephone Association.

The separate meetings of the plant, commercial and traffic employes should prove very interesting and profitable, affording opportunity, as they do, for the discussion of any subject affecting any department in the telephone industry.

The program follows:

TUESDAY NOON, APRIL 7.

Luncheon meeting of the board of directors.

TUESDAY AFTERNOON, 2 P. M.

Secretary-treasurer's report, Chas. C. Deering, Des Moines.

Legislative report.

President's annual address, Earle D. Bellamy, general manager, Bellamy Telephone Co., Knoxville.

Committee appointments.

General discussion for the good of the association.

WEDNESDAY, APRIL 8, 10 A. M.

"Directory Work and Directory Advertising," L. H. Larson, directory supervisory, Northwestern Bell Telephone Co.

"Wires and Trees" (illustrated), H. C. Hiatt, Kent, Ohio, Davey Tree Expert Co.

"Why a Personnel Director Gets Gray," L. C. Oberlies, Lincoln, Neb., personnel director, Lincoln Telephone & Telegraph Co.

Election of five directors.

WEDNESDAY, 2 P. M.

"Maintaining the Prestige of the Telephone Company," F. B. MacKinnon, Chicago, president, United States Independent Telephone Association.

"Co-ordination Between Plant and Commercial," Mark T. Caster, Lincoln, Neb., assistant general commercial superintendent, Lincoln Telephone & Telegraph Co.

"Fighting Depression with Increased Sales," R. A. Lumpkin, Mattoon, Ill., president, Illinois Southeastern Telephone Co. and president, Illinois Telephone Association.

WEDNESDAY EVENING, 6:15 P. M.

Annual banquet and entertainment.

THURSDAY, APRIL 9.

Plant men's school, conducted by Lester D. Meyers, superintendent, Boyer Valley Telephone Co., Woodbine.

Commercial employes' conference, conducted by Joseph R. Denkhoff, secretary, Iowa Telephone & Telegraph Co., Dyersville.

THE FIRST DAYS OF SPRING

By Miss Anne Barnes,

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

According to man-made calendar, Spring is here again. But do we need to look at the calendar to know that Spring is here? No. We hear the glad birds singing the songs of last year's birds who came and went. In their songs they tell us about swelling buds, pussy willows pushing their way out of their little brown coats, and of home planning.

Each year the promise of Spring and seed-time is fulfilled. And yet, how often we mortals say, "I wonder if Winter is really over; if Spring *is* here?" The birds are optimistic. They go their glad way singing. So should we.

However, our thoughts of Spring back again take more hopeful channels. This is as it should be, for we have read so much, heard so much, and talked so much about hard times, that we cannot seem to carry on a five-minute conversation that is not tinged with pessimism.

Perhaps, now that Spring has come, we will get out into the great open spaces more, as the birds are doing, and see nature all astir after its long winter rest period. Then we will feel like singing, too. We will walk with elastic step and breathe deeply. While our thoughts are taking these happy channels, Old Pessimism will disappear around the corner.

Instead of closing this article with my usual moral, I shall close it with this helpful anonymous prayer:

"Give me a good digestion, Lord,
And something to digest;
Give me a healthy body, Lord,
With sense to keep it at its best.
Give me a healthy *mind*, good Lord,
To keep the good and pure in sight,
Which, seeing sin, is not appalled,
But finds a way to set it right.
Give me a mind that is not bored,
That does not *whimper, whine,* or *sigh.*
Don't let me worry over-much
About the fussy thing called *'I.'*
Give me a sense of humor, Lord;
Give me the grace to see a joke;
To get some pleasure out of life
And pass it on to other folks."

Preparation for Installation and Cutover

Placing in Operation of New Central Office Equipment Culmination of Effective Planning—Preparation for Change of Single-Office Exchange from Magneto to Common Battery Operation from Viewpoint of Outside and Inside Plant

By H. T. McCaig,

Assistant Chicago Manager, Stromberg-Carlson Telephone Mfg. Co.

The expression "cutover" is one with which to conjure. It calls up in the minds of many, thrilling experiences through which they have passed and reminds them of the tough problems which have been met and overcome. In others, it quickens the imagination and enthralls through the uncertainty of anticipation.

A cutover may be of any proportions. It can be applied to the transition from one type of service to another in the metropolitan exchange or, with equal propriety, to the introduction of improvements on a simple grounded farm line. In whatever proportions we may consider it, we may be sure there are always some deeply interested in the processes involved and who are on tiptoe to see what is going on and to learn the outcome of the final procedure.

There is something of the dramatic in a cutover, providing an appeal even to the most seasoned veteran of the telephone fraternity. (Or do any engaged in this noble profession ever reach that particular stage?)

From a recent issue of the house organ of a well-known group of properties we follow the story of a cutover in one of its exchanges. "A nervous tension was apparent on every hand, a hushed stillness seemed to pervade the operating and plant rooms, everyone waited in breathless expectancy," says the correspondent. Who of our readers has not gone through one or more similar experiences? And then there are some who say there is no romance in business.

So that we may have some specific items to study, let us assume in this instance that the particlular cutover we have in mind is that encountered in the changing of a single-office exchange from magneto operation to common battery operation.

In preparing such an area for the change in service, we will assume that we are going to meet average conditions encountered in an exchange of 500 to 1,000 lines in which no selective party-line service has been furnished. We will plan on the adoption of harmonic selective signaling, and will have in mind the requirements involved in the providing of certain automatic functions in connection with the service to be inaugurated through the installation of the new equipment.

Several items of vital importance present themselves for solution almost simultaneously, and each of these must be appraised at its true value in making up our time card, or schedule, in the preparation of the exchange for the cutover.

Central office housing must be adequate not only to meet the requirements of the new and more elaborate central office equipment but that the company's commercial activities may have proper treatment and the community be properly impressed with the magnitude and scope of the work being done by the telephone company.

Mr. McCaig, with Over 25 Years' Experience in Engineering, Operating and Sales Work, Has Participated in Many Cutovers of Central Office Equipment and Is Well Versed in Their Requirements.

Primarily the building which is to be the home of the telephone company is an architectural problem and should be so considered. This should not, however, interfere with the adoption of floor plans and building arrangements which are the outgrowth of plans and suggestions offered by the equipment engineers.

In fact, if the building is erected without a due regard to these suggestions or if, more unfortunately yet, no equipment engineering plans are made up before the final adoption of building plans, only a miracle can prevent serious difficulties being encountered.

As a first essential, therefore, let us decide to consult the equipment engineers and have them make up for us tentative floor plans showing space requirements and equipment layouts. Around these the architect or building designer can mold his building to meet the other needs of the organization.

Almost without exception the man who is primarily responsible for the service in a magneto plant will tell you that his plant is giving good service. It makes little difference whether he has an all cable, full metallic plant, or is just hobbling along with a little cable and a lot of common return or grounded circuits. He is satisfied that his plant is giving good service.

If an attempt should be made to cut over this plant to common battery service without first searchingly investigating the actual existing conditions, the results might be too horrible to contemplate, for it is a well-known fact that magneto service—of a kind—can be given with plant conditions that are indeed most wretched.

Of course, there is an appreciable lack of efficiency in such a plant. Many of its characteristics readily may be shown to be far below par but, due to the fact that many troubles are not self-reporting while the lines are being worked on the magneto basis, they remain undiscovered in many instances for long periods of time.

Obviously not all magneto plants are open to this severe criticism, but it is safe to say that no magneto plant is "up to scratch" for the very reason just mentioned. Transfer the plant to common battery or dial operation, and most of these cases immediately make themselves manifest.

As the second major item to command our attention, therefore, in preparation for the cutover to improved service, we must make a thorough survey of our outside plant, finding its weak spots and reinforcing them up to the point where they will meet the requirements imposed by the adoption of the new class of service.

Assuming that we have a plant in which a sufficient amount of cable already is installed for securing economical distribution and that our plant already is on a full metallic basis, we will undertake a survey of this plant to prepare it for the handling of battery-operated lines. If the exchange which we are considering does not have a sufficient amount of cable, and that which it has is composed largely of split-pair conductors with grounded lines and common return service, our problem will, of course, be much more difficult.

The requirements of such a situation can, however, be fairly well conjectured, so we will not enter upon any discussion of such a problem.

To survey the plant we should set up testing apparatus in the present office and make such arrangements as may be necessary to test each line, together with the substation wiring of all connected instruments. This testing equipment need not be elaborate since it will be used only in making insulation and resistance tests.

Obviously the amount of equipment should be determined by the capacity for using it advantageously and economically. Generally one position of equipment will be quite sufficient for the size of exchange we are considering in this instance.

The testing equipment should consist of a wire-chief's voltmeter with associated keys arranged to test the insulation across the pair and between each conductor and earth. The same voltmeter will be used in measuring the loop resistance of each line. It should be wired so that through the manipulation of a key the testing battery can be disconnected and the voltmeter applied to the line to measure foreign currents with which the line may be crossed.

The tests should be made on days that present the most extreme insulation characteristics. Select the damp, dismal days for making these tests. If the tests can be made after a prolonged period of wet weather, so much the better. This gives an opportunity to test the line under the most severe conditions, when troubles will be in evidence if they are going to be bothersome at all.

A complete card record of all tests should be made. As the tests to a given station uncover conditions that must be rectified before common battery service can be given over the line or station wiring, work orders should be made out to meet the requirements of the situation.

As these work orders are returned, indicating that reclamation work has been done, other tests should be made for the purpose of determining definitely that the original troubles have been eliminated satisfactorily and that all conditions are now up to standard. Fig. 1 shows a typical test card, while a satisfactory test circuit is shown in Fig. 2.

It will be found that many twisted pair drops, for instance, which have been giving an acceptable degree of magneto service, will fall down completely when confronted with the necessity of meeting a continuous application of common battery current. Arresters that have been above suspicion will be disqualified when tested under bad weather conditions.

House wiring that has every appearance of being quite satisfactory will show leakage of such proportions as to condemn it. In this latter case it will probably be found that some of this trouble is due to both conductors of the house wiring being caught up by one uninsulated staple where an enthusiastic, but misguided, installer has driven the staple down too tightly across the two conductors.

Other building wiring will be found to be defective through the inroads of old age. There will be uncovered instances of building wiring carried through floors without tubing or other protection. In such instances this wiring will almost invariably show a breakdown of insulation at the floor line.

The insulation and line resistance tests can be made at the time the installer visits the station for the purpose of cutting a condenser in the ringer circuit of the magneto telephone. By thus equipping the telephone with a condenser it is placed in condition to function satisfactorily as a common-battery signaling, local-battery talking instrument after the cutover until such time as this telephone shall be reached in the campaign of telephone replacements.

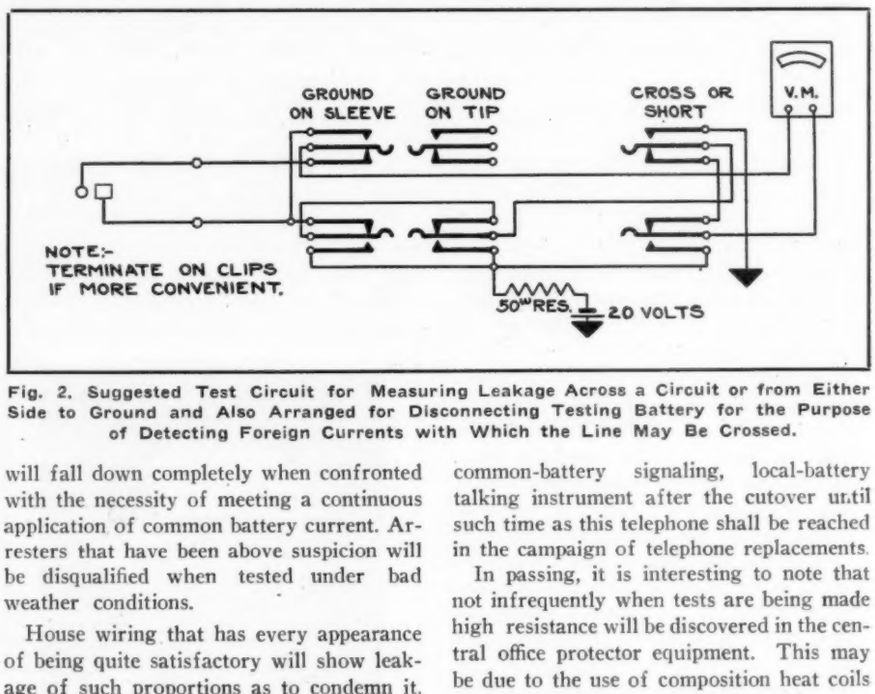


Fig. 2. Suggested Test Circuit for Measuring Leakage Across a Circuit or from Either Side to Ground and Also Arranged for Disconnecting Testing Battery for the Purpose of Detecting Foreign Currents with Which the Line May Be Crossed.

In passing, it is interesting to note that not infrequently when tests are being made high resistance will be discovered in the central office protector equipment. This may be due to the use of composition heat coils which seem to have the faculty of increasing in resistance, or it may be due to the presence of high-resistance wire-wound heat coils which should be replaced by the lower wound coils designed for use in connection with common battery lines.

If the old main distributing frame is to be kept in service, or if the protector equipment is to be moved from the old frame to the new and re-used, these points should be thoroughly checked and the proper steps taken to remove high resistance units from the protector apparatus.

It will not be difficult to arrange the testing equipment so that battery can be projected over the line in simulation of that which later will be applied by the connecting of this line to the common battery plant. By always applying the battery in the same manner, and then seeing to it that the lines after the cutover are similiarly connected, no mistake in poling of receivers will be made, unless a careless cableman, lineman, or installer reverses the line circuit after the testing has been done.

Ordinarily such reverses can be avoided by properly instructing all workmen of the seriousness of circuit reversal. Unless attention is paid to this item and all magneto telephone receivers are properly poled so that the exchange battery current flowing through the receiver shall reinforce the permanent magnetism of the receiver rather than oppose it, the service will not be satisfactory.

While most magneto exchanges are now well rid of series telephones having ringers of low resistance, there are a few still in operation. So it will be well to point out here the necessity for installing a con-

OLD

TELO. NO. 1238 NAME John Doe
TERM. NO. 42-BA LOCATION 1738 South 10th Ave.
CABLE CONDUCTORS 27-28 PROTECTOR 58-A GRD. Water Pipe
TYPE OF DROP #17 Tw. Pr. Bronze INSIDE WIRING Annunciator Wire
INSULATION TEST MADE 3-12-31 INSTALLER Williams TEST MAN Jones
WEATHER Wet TEMPERATURE 41° LOOP RESISTANCE 315ᵂ
RING TO GRD. 12 Volts TIP TO GRD. 14 Volts
MAKE OF MAG. TELEPHONE Acme TYPE Wall Set 5-1600ᵂ
LIST ADD'L EQUIPMENT Ex Desk Stand only upstairs
LEAKAGE LOCATED IN Basement wiring
WORK ORDER MADE OUT 3-12-31 to provide new interior wiring for main and additional stns - 2 new services

NEW

REWIRING COMPLETED 3-20-31 INSTALLER Miller and Hodges
WORK DONE New #19 Triple R.C. & Braided to main set in L-R. to two B-R and to Kitchen
NEW INSTRUMENT (MAIN SET) #986 Desk Stand #1156Y ADD'L. EQPT. #1177 Hand Sets in two B-R, #1181 Hand Set in Kitchen
INSTALLED 3-24-31 BY Miller and Hodges

Fig. 1. A Typical Test Record Card. This Should Be Made Up on a 5-Inch by 8-Inch Card to Fit a Standard Filing Cabinet.

denser of not less than two-microfarad capacity in the ringer circuit of such a telephone. One microfarad condensers may be used with complete satisfaction in the ringer circuits of bridging type telephones, but in the case of series ringers not enough current is passed by the one microfarad condenser to give satisfactory signaling results.

If the new central office equipment is to be installed in a building separate and apart from the location occupied by the magneto equipment, the cutover processes will be simplified materially if a straight bridged cutover is made.

In such a layout a complete multiple of the main exchange cables as they appear on the magneto exchange main distributing frame is carried to the main distributing frame in the new office. This makes it possible to pick up in the new office every line in service on the old magneto board and, by testing to all stations,

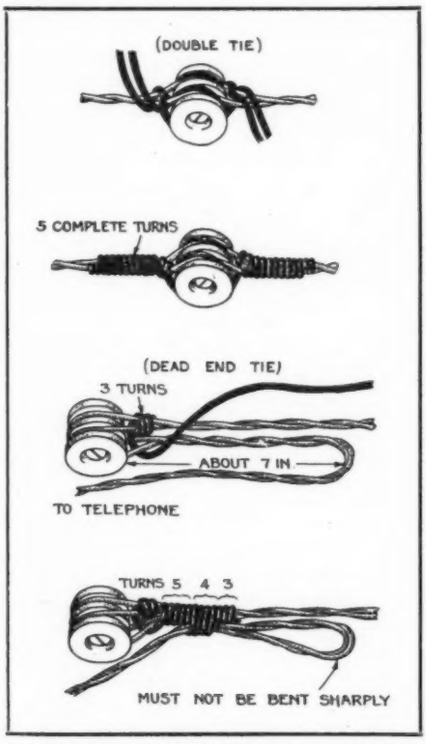


Fig. 3. Steps in the Making of Satisfactory Twisted-Pair Drop Ties.

to insure the fact that all telephones are connected into the new office.

At the time the installer visits the telephone for the purpose of cutting-in the condenser and making the insulation and line resistance tests he should carefully check the premises with a view to satisfying himself as to the condition of all accessory equipment located therein, such as extension telephones and extension bells. These must all be visited and tests made from each back to the testboard so as to determine the line conditions to these accessory items.

The installer should turn in a complete record of all apparatus at each station, this report to be checked with existing records. Any discrepancies which may be noted should be ironed out at the first opportunity so that the station record shall be as near as possible absolutely correct.

If there is any inclination on the part of the management to invest the installer with authority for doing so he should be instructed to canvass the customer at the time he is making the insulation tests on the subject of changing to a better class of service or of subscribing for additional service. For instance, desk-set or hand-set business may be solicited from subscribers now having only wall telephone service.

Extension telephones should be recommended as time and step savers. The opportunity is one that really ought not to be passed up. Frequently the suggestions of the installer are taken in very good part, since he is seen to be giving expert advice and to have no ulterior motive such as might move a commercial agent or solicitor to make the same recommendation.

Referring again to points which should be thoroughly checked in connection with line conditions, we find that not infrequently leakage conditions will be uncovered in old terminal cans through the accumulation of grease and dirt between the terminals, or binding posts. If these cannot be cleaned up on the job the old terminal can should then be taken into the shop and gone over in a thorough fashion so as to make it suitable for re-installation.

At junction poles, or at terminal points where a large number of drops are taken off, it is frequently found that leakage conditions are set up through the accumulation of moisture where twisted-pair jumpers, or drop wires, are bunched together in the bridle rings.

Sometimes this moisture is held in contact with the wire insulation for long periods, due to the slow rate of evaporation through exclusion of air. The remedy here lies in decreasing the number of jumpers carried through a given set of rings or, possibly, in providing larger rings with more room for the necessary number of jumpers.

In erecting drop wires too much care cannot be taken in seeing that supports are so designed and applied as to hold the drop wire firmly in place without focusing the strain at some particular point. To fall into this error would increase the vulnerability of the drop wire to a point where the insulation would soon break down under the strain.

A great deal of thought has been given the subject of developing proper ties and supports for drop wire. This, together with a long period of experimentation, has finally brought about the adoption of standard methods which should by all means be invoked. While it is true that many plant superintendents and line foremen feel that their particular method of applying drop wire ties is the best that can be developed, yet it will pay good dividends

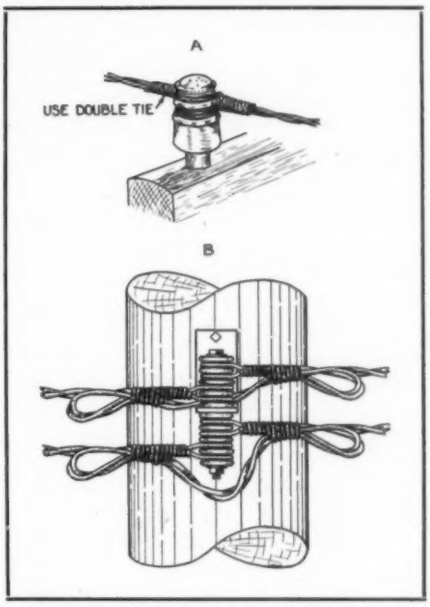


Fig. 4. Tying to Insulator and Dead-Ending at Pole.

to adopt a well-proved standard and to see that all drops are erected in accordance therewith, Figs. 3, 4, 5 and 6.

This is true also of entrance wiring. The drop wire where it enters the building should be carried through tubing, Fig. 7. The hole for it should be drilled so that the tube will slant upwards towards the inner side of the wall. In forming the drop wire into position be sure to see that it is so formed at the outer end of the tube that all moisture accumulating on, and running along, the drop wire has a chance to drip off and not be conveyed through the tube to the inner side of the wall.

In determining the kind of drop wire to be adopted as a standard select a type

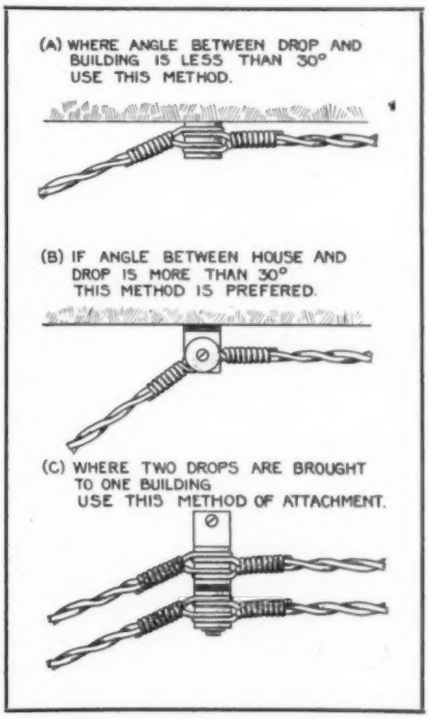

(A) WHERE ANGLE BETWEEN DROP AND BUILDING IS LESS THAN 30° USE THIS METHOD.
(B) IF ANGLE BETWEEN HOUSE AND DROP IS MORE THAN 30° THIS METHOD IS PREFERED.
(C) WHERE TWO DROPS ARE BROUGHT TO ONE BUILDING USE THIS METHOD OF ATTACHMENT.

Fig. 5. Attachment Details.

which has received the approval of the industry.

Wire used in our substantion wiring need not be of such severe specifications as drop wire but it should be of a very good grade. While inside wiring quite generally is not exposed to severe weather conditions, as in the case of drop wire, there are occasions where good insulation is imperative if it is to survive and do a creditable job.

The labor item of replacement should be considered as a determining factor in choosing good interior wire and, quite obviously, service interruption should not be overlooked. In wiring subscribers' premises, wiremen should be cautioned to be careful in their use of the subscriber's property and to exercise great caution and neatness in going about the job of rewiring.

If the workman makes as little disturbance as possible and makes certain that all debris is carefully cleaned up, with all evidences of his work about the place removed before he leaves the job, a much better impression is created in the mind of the customer, and we may be sure public relations are helped just that much.

Wherever possible, and at all consistent with prudent administration, subscriber station wiring should be concealed. This will not be difficult if the wireman is schooled in appraising the situation and properly instructed in the processes to be followed in locating and using the hidden, but available, wire-ways.

Preferably entrance wires should be brought into the subscriber's basement and a protector of approved design located close to the point where the wires actually enter the premises, Fig. 7. Wiring from this point to the substation sets should be done either with dry-glazed-braid, rubber-insulated wire or saturated-braid, rubber-insulated wire.

It has been customary in the past to use No. 19 B. & S. gauge soft copper conductor wire for this purpose. More recently a number of companies have found very satisfactory results following the adoption of No. 20 gauge wire. In some cases No. 22 B. & S. gauge conductor is being used for this purpose.

If the wiring is to be exposed for any considerable distance, and especially if this exposure is in living or working quarters above the basement level, it is suggested that the wiring be of the dry-glazed-braid type, for it is more sightly and will create less of a contrast against walls or base boards than would the saturated-braid wire. If the wiring is to be concealed in walls and brought through the wall into the telephone or desk-set box without being brought into sight, the use of saturated-braid wire is suggested as being better for the purpose.

There is little question of the advisability of wiring all substations with triple conductor wire, for one is never quite sure when the time will come that divided circuit ringing may be wanted at any station. If the third conductor is carried through at the time the station is wired, or rewired, it is available for this service at any time. Of course, there will be involved an investment in wire which in some cases will be inoperative over a period of many years, but that additional investment can soon be justified by balancing against it the cost of a few jobs of rewiring in order to get a ground wired into the substation instrument.

All of the foregoing thoughts have been directed towards the plant end of our proposed cutover. There are some other factors which ought to be given consideration, for they should never be overlooked in anticipation of cutover time. One of these is the training of subscribers and the information to be passed out to them. The other is the training of operators and the work which must be done with them in preparing them for the operation of the new switchboard.

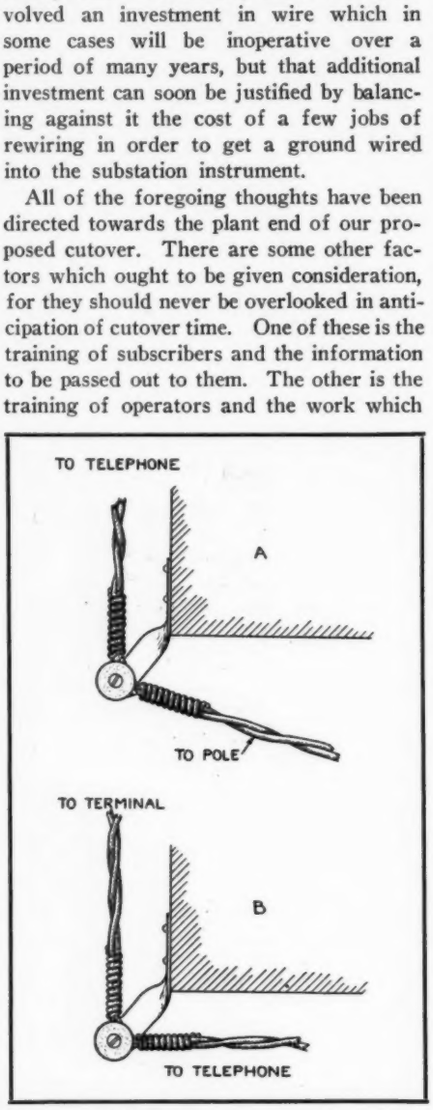


Fig. 6. Method Used in Carrying Drops Around a Corner Using Standard Fixtures.

In moving from magneto operation to common battery operation the subscribers need very little training. In fact, they do not need to perform any new tasks but need only to "cease and desist" doing one of the things they have been in the habit of doing. After the cutover they will not have to ring to get Central. If they do, it won't hurt anything.

A simple word of explanation made at the time the station is visited by the insulation testman, plus a reasonable amount of publicity in the local papers, will acquaint the subscribers with the fact that, at the time appointed for the cutover, they should abandon turning the crank to get Central or to ring off, and begin to use their telephones in the more simple and truly automatic way—lift receiver, make known their wishes, and let Central do the rest.

In assisting our operators to become familiar with the new equipment we shall probably get off as easily as we do in instructing our subscribers in the use of the new service. Fortunately, with the improvement in the design and manufacture of switchboards come great improvements in their operating characteristics with a consequent lessening of effort and strain on the part of the operators attending them.

Whereas in the old magneto switchboard the operator's incoming line signals appeared on large and rather cumbersome shutter signals, here, on the common battery board, all line signals come in on lamps, compactly arranged, so that great quantities of incoming signals may be made to appear within easy reach of any operator. If we have adopted the multiple line lamp and associated lamp multiple idea in the design of our switchboard several operators have an opportunity to team together in the answering of any incoming line call.

Thus, if one is exceptionally busy, she may immediately be assisted by another who is less busy at that particular moment. Regardless of the point at which the call is answered, the desired line and station may be reached because it is multipled before the operator who has answered, as well as before all other operators on the board.

This is a new sensation for many operators transferred from magneto switchboards where calls to some lines are of necessity trunked, or transferred, by means of transfer circuits. It is apparent, therefore, that in advising an operator that she can answer any line or connect to any line, by finding all of them within easy reach, we are making her job at least no heavier and, in many instances, it will be much lighter than it has ever been before.

Heretofore, the operator has, upon the completion of the connection to the desired line, manually rung the called station—code ringing if the call were to a party-line station—and thereafter listened-in on the connection to see if the called station had yet answered. On our new common battery board the operator will, upon connecting with the called line, depress the button which selects the proper station on that line—and the machinery will thereafter periodically ring that station without further attention from the operator.

The operator will not have to cut in on the circuit to see if the called party answers for, at regular intervals, a ringing tone will be sent back to the calling subscriber, audibly informing him that the telephone he has called is being rung. When the called party answers, he automatically disconnects this machine ringing which has been periodically ringing his bell.

If the calling subscriber listens for quite a time and gets no response to the repeated rings, of which he has been advised by the ringing tone, he then hangs up, concluding

that the called subscriber is not going to answer. He will automatically stop the ringing of the called subscriber and at the same time set disconnect signals in the operator's cord circuit so that she is given positive information, assuring her that she may take this connection down.

If the calling subscriber wishes to make another connection—possibly in an effort to locate the called party at some other telephone—and moves his hookswitch down and then lets it go up again, he will not only stop the ringing of the called station but he will institute a flashing of the supervisory lamp connected with the cord which is in contact with his line.

This will immediately attract the attention of the operator, who will cut in with the customary salutation, secure the number now desired, and complete the connection to the station now being called by the calling subscriber.

The latest development of this machine-ringing, operator-assisting, cord circuit is almost uncanny in its completeness. It is developed to a point where, regardless of the number of cord pairs in the operator's position, she can make the proper station selection through the manipulation of one set of station-selecting keys common to the entire position. This does away with the necessity of putting in a set of station-selecting keys in each cord circuit.

Since we are adopting selective four-party service in a plant where previously we have not had this service, there is more than ever the need of following standard practice in marking our multiple field. This job properly done will be an invaluable aid to all operators and should by no means be overlooked.

Testimony from many chief operators is available, stating in unmistakable terms the benefit to be derived from keeping multiple jack marking up to date. In fact, it is rather difficult to see how a proper grade of service can be rendered if such a scheme is not invoked and religiously followed. Through its use, operators are immediately notified of things so necessary for them to know, if they are to give an acceptable grade of service.

Suppose our exchange on the magneto basis has provided a party-line service involving only code-ringing of the stations—there having been no selective service rendered. With the inauguration of the new service with machine ringing, it is clear we would encounter some difficulty if we attempted to continue the code-ringing system; moreover, we have decided to inaugurate selective party-line service and we have filed a rate covering it.

As a part of our pre-cutover campaign, therefore, we will convert our code-ringing party-line stations to harmonic selective stations. To accomplish this we shall install in advance the harmonic ringing current generators chosen for our permanent installation, install party-line master keys in each position of our old magneto switchboard, and prepare gradually to convert our code-ringing stations to full selective service.

If the new exchange quarters are sufficiently advanced towards completion to warrant our doing so we can to advantage, very probably, install the harmonic converter, or other source of selective ringing current, in its permanent location and wire

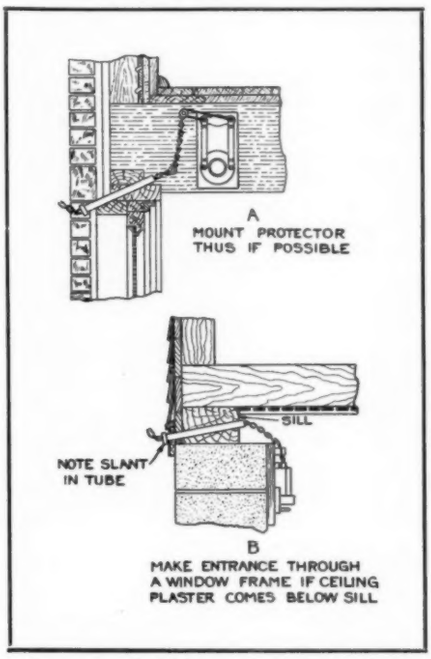

A
MOUNT PROTECTOR THUS IF POSSIBLE
SILL
NOTE SLANT IN TUBE
B
MAKE ENTRANCE THROUGH A WINDOW FRAME IF CEILING PLASTER COMES BELOW SILL

Fig. 7. Installation of Entrance Wires.

from it temporarily to the magneto board master keys. Otherwise, we shall probably find it necessary to make a temporary installation of the harmonic current ringing machines in the old office, with a move to the permanent location shortly prior to the cutover.

At the subscribers' stations the change to selective service can be made by following either of two plans: The ringer of the magneto telephone may be replaced with a harmonic ringer; or the new common battery instrument may be installed and its ringing circuit be made to serve as the signaling equipment for inbound calls. In the latter case the ringer circuit of the magneto telephone should be opened, but the rest of the instrument left operative.

Obviously, the choice of these methods is almost wholly dependent upon the speed with which it is proposed to carry on the campaign of telephone replacement following the cutover.

In a foregoing paragraph relative to operating the statement was made that an operator could connect to any desired line in the exchange. This will have to be modified to a certain extent by excepting the rural lines and, of course, the toll lines. Unless the rural lines are changed to common battery operation at the same time the local lines are changed, we shall find it necessary to adopt one or the other of two schemes in order to have connections established between the common battery town lines and the magneto rural lines.

Either we must have universal cord circuits throughout the board so that the local operators may immediately complete connections from town to rural and vice versa, or we must install trunk circuits which will enable the operator to transfer a common-battery subscriber who has called for a rural line over to a rural position operator, where, through the medium of universal cord circuits, such a connecnection can be established.

If we adopt the former expedient, we slow down the handling of a position through asking an operator, who might otherwise be engaged in speedily completing local-to-local connections, to spend part of her time in supervising rural connections and in code-ringing subscribers on these lines.

If we adopt the trunking idea we should install a trunk circuit which will permit the largest measure of freedom from annoyance and bring about the largest measure of satisfactory service. Such a trunk circuit will be terminated in a plug and cord on the local operator's position and in a jack and lamp on the universal position.

When a common battery subscriber calls for a rural station, the local operator who has received this call will substitute the trunk plug for the answering plug with which she has just answered this subscriber. In so doing she will shift his incoming call to the universal position where it will be answered by a rural-line operator equipped for immediately connecting with the desired rural line and for code-ringing the station desired by the common battery subscriber.

If for any reason the calling common-battery subscriber wishes to regain the rural operator's attention—such as would be necessary, for instance, in case the wrong party answered on the rural line—by manipulating his hookswitch he institutes a flashing recall similar to that described in an earlier paragraph. The rural operator thus flashed can connect him with any line in the exchange, either local or rural, and properly supervise the connection.

Such a trunk circuit, obviously, avoids the embarrassments and delays otherwise certain if the trunk circuit were of the type terminating in jacks at both ends of the circuit. Not only is the supervision and lack of annoyance an outstanding feature of this plug-to-jack trunk, but, as may be suspected, the transmission is much better since only one cord circuit and a simple trunk circuit are involved during the period of local-to-rural connection.

In the case of the jack-to-jack trunk circuit, one universal cord circuit and one feature type common-battery circuit are involved in this same type of connection.

This rather long dissertation on the handling of rural traffic has been injected

(*Please turn to page* 55)

Toll Conduit Built on Private Property

Construction of Toll Conduit Between Albany and Catskill, N. Y., Across Private Property Introduced Problems in Design, Construction and Maintenance Not Met in Work Along Highways—New Features of Recent Work

By G. P. Dunn and J. C. Nash,
New York Telephone Co.

The toll conduit between Albany and Catskill, N. Y., recently completed, was installed largely on private property. Prior to the construction of this project the use of underground conduit had been confined generally to highways and city streets. Because construction across private property introduces problems in design, construction and maintenance not met in work along highways, it is felt that a description of the experiences on this project will be of value in planning and building underground systems of a similar nature.

Subway Study.

At the beginning of the year 1929, two aerial cables—the "A" and "B" cables—were in service between New York and Albany. A third, the "C" cable, was constructed aerially as far north as Catskill in 1929. Growth studies indicated that the "C" cable would be required between Albany and Catskill in 1930, and that subsequent cables would be required at approximately two-year intervals. After comparing available types of construction, it was decided to construct underground conduit to provide for the "C" and subsequent cables from Catskill to Albany.

The decision as to the type of construction was based on the expected reduction of maintenance costs, the prospect of fewer service interruptions, and the right-of-way situation in this region. It was anticipated that if aerial construction were adopted, right-of-way would be difficult to acquire and would become increasingly so as each succeeding line was required. This situation was a very important factor in favor of underground construction.

The anticipated circuit requirements for the period of study, 15 years, indicated an ultimate need of nine cables. A formation was adopted consisting of one six-duct standard-bore conduit designed to be laid two ducts wide and five high for convenience in racking the cables in the manholes.

This formation was used throughout the work with the exception of short stretches in the city of Albany and in the village of Catskill, where exchange ducts were constructed in the same trench as the toll run.

At these points separate manholes, offset from the line, were constructed for the exchange ducts, and the toll ducts were carried through with a uniform formation.

The general route follows the west side of the Hudson River valley through gently rolling country consisting largely of cultivated land and orchards with occasional small villages and hamlets. The soil is generally clay loam and clay, although the southern part of the project passes through considerable sedimentary rock which required blasting. At several points the line crosses swamps consisting of fine sand overlaid with muck.

Factors Affecting Selection.

Preliminary trips over the proposed general route indicated that construction over private property rather than along existing highways was desirable. At the present time the only improved road along the route is rather circuitous and, in general, only 18 feet wide. The curves are frequently quite sharp. The highway department is planning to improve a route on the west side of the Hudson River similar to the high-speed highway recently completed on the east side, and major changes of line and grade were anticipated.

At many places along the road, rock is close to the surface, and substantial blasting operations would be required in connection with highway improvement work. It would be practically impossible to maintain a subway while highway construction operations were under way.

Because of the present narrow road, construction of a subway in the shoulder would seriously interfere with traffic. Subsequent highway widening and realignment would undoubtedly throw some of the manholes under the driving surface, which would create a dangerous situation when the manholes were open for any new construction or repairs.

Aside from the construction difficulties which would attend the selection of a highway route, there were other factors tending to throw the balance in favor of construction on private right-of-way. Construction along the highway would have subjected the cable to exposure to a 66-kv. transmission line which parallels the road for about 16 miles, whereas it was possible to select a route on private right-of-way that reduced this exposure considerably.

Also, this permitted the construction of the conduit in practically a direct line for its entire length, thus shortening the line by approximately three miles as compared to the shortest highway route. This, of course, represents a substantial saving in present worth for the plant contemplated during the period of study. Furthermore, this reduction in length was of added importance, inasmuch as it might otherwise have been necessary ultimately to build an additional repeater station.

Preliminary office studies of the route were made on a composite map of United States Geological Survey sheets showing the area through which the line would pass. A tentative line was laid out for study in the field and trips were made to check the desirability of this line, keeping in mind at all times that all points along the route had to be accessible to motor vehicle equipment.

Detailed Survey.

Aerial photographs were also used in the preliminary studies of the route and in the right-of-way negotiations. These photographs presented physical conditions in more detail than the U. S. G. S. maps and also indicated improvements which had been made since the maps were last revised. They showed the objects which were to be avoided, fence and property lines, and the character of the land through which the proposed line was projected.

At one point the photographs disclosed an abandoned railroad grade close to the proposed line. Investigation in the field showed that about five miles of this right-of-way was adapted to the requirements of the proposed line, and the tentative route was located to include this section.

The photographs, with the proposed line drawn upon them, proved of considerable value in later discussion. With their aid, property owners were shown how the line would cross their properties, and the important features of the route were pointed out to the surveyors. They also proved useful in condemnation proceedings.

Factors Affecting Location.

The line was laid out with as few deviations from a straight line between the termini as was consistent with economical construction. However, various factors, physical and electrical, influenced the decision as to the best location. Exposure to potential electrical troubles caused the most important deviations.

On the southern end of the project, the direct line route would have carried the subway parallel to a transmission line with very little separation between the two lines. Five miles of the tentative line were relocated to reduce this exposure. At other points along the line minor deviations were caused by the estimated inductive effects of proposed power lines and the possible electrification of a paralleling railroad.

There were many physical features which caused minor bends in the line. Some of these were natural, such as streams, swamps, rock and steep banks; and some were man-made, such as railroads, high-

ways, and buildings. Crossings under railroad tracks were made approximately at right angles to the tracks.

Streams and ravines were crossed on existing bridges or at sites where it was economical to build new structures. Swamps and rock were avoided wherever it was possible to do so with a slight relocation of the line. Steep banks were crossed at points suitable for building and maintaining the duct line.

The final line consisted of about eight miles of construction in city streets and along highways and 24 miles of construction on private property. The total length of the conduit line is approximately 2¼ miles more than the airline distance between the cable vault at the central office in Albany and the cable house at Catskill, the termini of the project.

Materials.

Comparisons of estimated costs were made between the costs of manholes built of brick, pre-cast concrete slabs, concrete blocks and concrete cast in place. Labor costs on brick and concrete block construction appeared to be much higher than on the other types. Special equipment would have been necessary to place the pre-cast slabs and a satisfactory joint between slabs would have required the pouring of a concrete key of some description.

Concrete, cast in place, was adopted as estimates indicated that it involved the lowest cost and offered no particular construction difficulties as the form work and pouring would be quite simple. In addition, greater strength could be secured in a cast-in-place manhole, and a waterproof structure could be more easily built in wet locations.

The costs of various types of conduit joints were studied. The ordinary troweled Portland cement mortar joints had substantially lower costs but some trouble had been experienced in their use. A mortar joint, with sides poured in vertical metal forms, was finally adopted as it could be made cheaply and its use overcame most of the objections to mortar joints made with a trowel.

Plans were prepared showing the location of the proposed line in the city of Albany and in the village of Catskill. Short sections of exchange conduit were constructed in the same trench with the toll run at these points. These combined runs required various duct formations.

The plans showed these formations, existing underground construction where records were available, the location of the proposed line and topographical features. With the exception of sketches of a few restricted points along the line, profiles alone were used on the work through rural sections.

In this connection, a combined plan and profile of the work is more desirable as many important topographical features cannot be shown satisfactorily on the profile. Such plans can be used to advantage throughout the construction work, and items for use in preparation of the plant records can be noted thereon as construction progresses.

Profiles were drawn for the sparsely-settled section of the route in Albany and for the remainder of the project. Scales of 1 inch to 100 feet horizontally, and 1 inch to 100 feet vertically, proved satisfactory. Beside the original ground line, various topographical features were noted on the profiles. These included the highways, railroads and streams crossed, alignment data, existing culverts, old foundations and some properly lines.

The proposed use of protective coverings was indicated at the proper points on the profiles as well as other construction data, such as culverts and bridges, and sections requiring special duct materials.

Manholes were laid out and a grade line for the bottom duct of the tile was plotted. The following objects were kept in view in designing these grades: Every point on the duct line was designed with a fall of at least 3 inches per 100 feet towards a manhole or a positive drainage point. A minimum cover of two feet was provided for the duct structure wherever practicable, but trench of excessive depth was avoided. Existing surface drainage channels were kept open.

Conduit was placed on fills wherever underground construction and maintenance seemed uneconomical. Manhole covers on private property were kept one foot above the surrounding ground when this did not require an excessively high collar.

This facilitated location and prevented the entrance of surface water and mud into the manhole. Manholes were so located as to use the longest sections of oversize cable

1. Fill Placed Where Albany-Catskill, N. Y., Toll Conduit Route Traverses Swampy Land —2. Sewer Pipe Culvert Under Conduit on Fill—3. Concrete Culvert Under Conduit on Fill—4. Manhole Partially Above Ground (Exterior View)—5. Manhole Partially Above Ground (Interior View)—6. Piers for Conduit Bridge—7. Steelwork for Conduit Bridge.

obtainable wherever it seemed feasible to pull such sections.

A survey was made of the available unloading points along the route and the project was broken up into sections with the most economical hauls from these points. Storage yards were rented near each siding to care for the materials which could not be hauled directly to the job.

Light strips of wood were placed under the stacks of conduit and proved satisfactory when the storage period was not too great. For storage periods of three months or more, substantial sleepers should be placed under the stacks to supply a firm bearing, and to prevent the conduit from freezing to the ground and getting mud in the ducts.

Work in the city of Albany was started on July 29. Construction work on the rest of the project was started shortly thereafter. Working conditions on the rural sections were such that mechanical equipment could be used on about three-fourths of the excavating and backfilling. In all, five trenching machines, five mechanical backfillers, and three types of excavators were used.

The trenching machines used included one wheel type machine and four ladder type machines. One of the latter type had a swing discharge belt and the other three had stationary belts.

Duct Construction.

To secure two-foot cover, a trench over four feet deep was required. A trench width of at least 24 inches was necessary to allow the tile layers to work conveniently in a trench of this depth. Two men could generally dress the bottom of the trench sufficiently, even when the trencher was operated at high speed.

Generally the trenching machines could dig much faster than the gangs could lay tile. To avoid the use of shoring, the tile-laying operation was kept close behind the trencher, and the speed of the machine was adjusted to that of the gang.

The machines were started before the gangs and stopped earlier, so that very little trench was left open at night. The light, ladder type machine would dig hourly 150 feet of five-foot trench, 27 inches wide, without trouble. The speed of the other machines was comparable.

With the exception of two cases of special bridge attachments and one case of steel pipe placed on a steep bank, vitrified clay conduit was used throughout the project. The tile was hauled by truck to practically every point on the line, the loads being reduced when the hauling was too hard.

Only standard lengths were hauled and stocked in rural sections, the short and special pieces being secured when required. The other materials used in the duct work were standard, with the exception of the forms and covers used in making the joints.

Wherever soil conditions were favorable, no top or bottom concrete protection was placed where a two-foot cover was secured, as it was felt that the danger from excavation was too slight to warrant the placing of protective concrete and a satisfactory bed could be secured without the use of a concrete base. However, concrete top and bottom protection was used through cities and villages and wherever the conduit line was within 100 feet of a highway. The concrete used was 1:2½:5 mix and was kept rather dry (about one-inch slump). At all points where less than two-foot cover was secured, concrete top protection was used.

Special Construction.

Through swamps and across ravines, the conduit was generally placed upon fills made of suitable local material. The decision as to whether the conduit would be placed underground or on a fill was affected by various considerations. The accessibility of the duct line and the assurance of positive drainage were the principal factors supporting construction on fills in most cases.

Construction on fills was expensive because not only was the fill material required, but also forms had to be set and concrete protection poured around the conduit. Generally, some sort of drainage structure had to be built also, to carry the natural surface drainage through the fill.

Where underground construction would have been as satisfactory, comparisons of costs of the different methods were made. At some points cost considerations were not a factor, as underground construction would not have been satisfactory because of the impossibility of draining the ducts.

The fills were made 10 feet wide across the top, with 1½:1 side slopes. Fills greater than three feet high required a wider right-of-way, or a reduction of the top width. Both methods were used with satisfactory results. The fills were placed in thin layers and thoroughly compacted, as time was not available to allow them to settle.

In two cases, suitable local material was not available, so screenings were secured from nearby quarries and used in the fills. This material is apparently satisfactory, but few of the fills have been subjected to erosion as yet, so no definite experience can be cited.

The possibility of using trestle construction, consisting of a concrete slab resting on concrete piers, was studied but it was found that this method would have been economical only where the height of fill exceeded four feet. This type of construction could have been adapted to crossing ravines but suitable footings might have been difficult to build in swamps.

Culverts.

Vitrified clay pipe and concrete culverts were used to provide drainage through the fills, the type depending on the relative costs and the requirements of the site. No head walls were used on the pipe culverts as the height of the fill was generally low and it was cheaper to extend the pipe to the points where the slopes of the fill met the normal ground.

Concrete culverts proved more economical than the larger sizes of pipe. The former were used for sites where a waterway greater than that afforded by a 24-inch pipe was required to carry a stream through a fill. Span lengths of 6, 8 and 10 feet were used depending on the location and waterway requirements. The design consisted of a reinforced concrete slab resting on two concrete abutments.

The abutments were designed with wings to retain the fill. The conduit was laid on the slab with a mortar bed and encased in concrete. Footings were carried to a depth sufficient to avoid erosion and frost heave. Where the duct line drained to the culvert, weep holes were left in the slab to carry off the water.

These functioned satisfactorily at normal temperatures, but during prolonged cold weather ice formed in the weep holes. This resulted in the water backing up in the ducts and subsequently freezing. To remedy this condition intercepting drains were installed in the banks on either side of the low spot. These drains consist of a stone pocket under an open joint in the tile. Where practicable, an eight-inch vitrified pipe is installed to drain from the pocket to an outlet.

Where manholes were required in sections where the conduit was laid on a fill, the design was modified to provide for pulling-in through the end of the manhole by constructing a pressed steel coal window in the ends above the ducts. Recesses were constructed in the end walls of the manholes. The manhole walls were carried through the fill to bearing on a substantial footing built in the original ground.

Conduit Bridges.

At six points along the line where small streams had to be crossed, studies were made to determine the most satisfactory method of crossing. The costs of wrought iron pipe, steel pipe encased in concrete and a concrete and steel trestle structure were studied and the concrete and steel structure seemed most economical and assured drainage of the duct line. Special conduit bridges were designed to carry the line across these streams. These structures were constructed of steel channels and angles encased in concrete for protection.

Beside the dead load, the designs provided for a live load consisting of one cubic foot of ice per foot of span. The structures were so designed that the entire weight was supported by the steel, the only function of the concrete encasement being that of protection to the steelwork and duct, and affording also a somewhat more sightly structure.

The bond between the spans and the piers and abutments was broken so that only vertical stresses could be transmitted

to the supports. The normal section of tile conduit was carried through in each case. Span lengths varied from 10 to 40 feet.

Comparisons of costs were made for these and longer spans. On one structure, during the time between the design and the construction, the water level rose so that the span length required to keep the piers on dry land was increased from 42 to 55 feet. The possibility of building a longer span and keeping the piers on dry land was investigated, but it was felt that constructing the shorter spans with the piers in shallow water would be more economical.

The designs of the long span structures required material which was not available locally. They were revised so that material from local shops could be used because steel deliveries in Albany were uncertain. These revisions consisted in riveting heavier angles on the channel beams and riveting plates on the vertical leg where angles were used for the beams. Longer spans would have required the use of built-up members involving special erecting equipment.

Drainage Provision.

Drainage of the duct lines was provided for in laying the grade lines on the profiles. Subsequent changes in the manhole locations threw two low points in the duct line. A pumping sump consisting of a concrete box with six-inch walls, floor and roof, was constructed at one of these points.

The inside dimensions were 4 feet by 4 feet and it was carried to a depth of one foot below the bottom duct. It was equipped with a type "B" 27-inch manhole frame and cover, so that a man can get in and clean out any silt which might wash through the tile and be deposited in the hole.

At another point, a stone drain and outlet pipe were placed at the low point in the duct line. Such conduit drains were used only where a positive outlet could be secured, as it was felt that without positive drainage a rise in the water table would cause water to flow from the drain into the duct line.

Where there was less than one foot cover, or where the conduit was exposed, it was completely encased in concrete. This encasement consisted of a four-inch concrete base and three-inch sides and top. Where the conduit was in a trench, no forms were used for the encasement. When the conduit was even with the ground or on a fill, a trench was dug for the concrete base and side forms were used. One-half inch reinforcing bars were placed in the base to prevent any local settlement of the fill from affecting the duct line.

Wire mesh 6 inch by 6 inch by 14 gauge was also placed in the base and around the tile to help hold the encasement in position. A one-inch chamfer strip along the top of the form was used to furnish a guide for smoothing off the top. This chamfer also decreased the possibility of spalling along the top edges.

Concrete for the encasement was of 1:2:4 mix using ½-inch stone. The use of larger stone was tried but it was found too difficult to avoid honeycombing. The exposed surfaces were floated immediately after stripping the forms and defective places were patched.

Provision for expansion was made in most of the concrete encasement on conduit built above the ground. Two types of expansion joints, poured and premolded, were constructed and some short sections of encasement were constructed without joints. Cracks about 30 feet apart have appeared in the latter sections but, as the cracks are small, no serious trouble is anticipated.

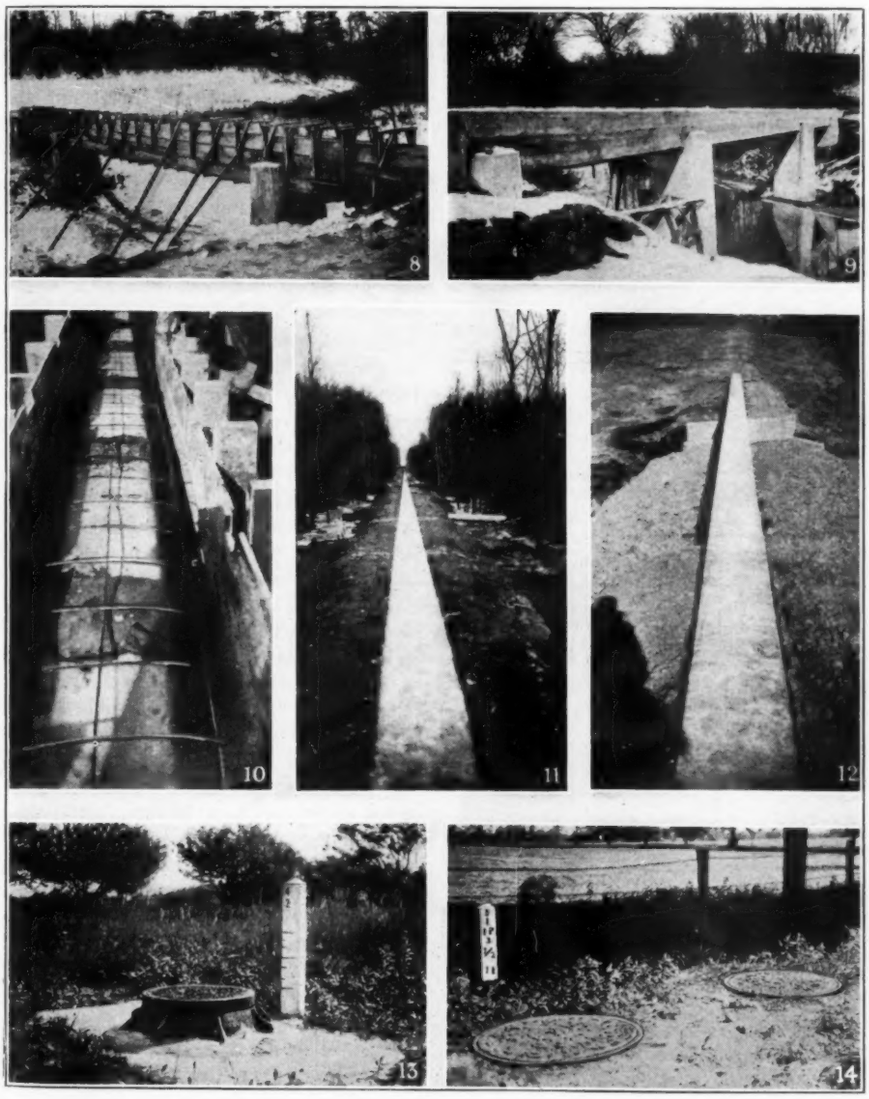
In both cases where joints were provided, they were made only in the concrete encasement, it being felt that if sufficient stress develops, the bond between the concrete and the section of tile spanning the joint will be broken and the expansion joint will function.

Three-quarter-inch premolded expansion material was used for one set of joints. This material was placed to form a transverse joint through the concrete every 30 feet. In the case of the poured joints, wooden bulkheads one inch thick were placed in the concrete 30 feet apart. These were pulled after the concrete had set, leaving a break in the encasement. These spaces were then filled with bituminous mastic joint filler.

Manholes.

Manholes on the toll run are so designed that no cable will have to be moved after splicing. This feature seemed so desirable that a study of the possibility of splaying the ducts entering the manholes was made soon after the work was begun.

The results indicated that because of the special features involved in the construction of this project, the costs of splaying would



8. Forms for Concrete Encasement of Conduit Bridge on Albany–Catskill, N. Y., Toll Conduit Route—9. Conduit Bridge Completed—10. Forms and Reinforcing for Encasement of Conduit Structure Placed Above Ground—11. Conduit Structure on Fill—12. Conduit Structure on Fill Showing Drainage Culvert—13. Manhole Marker on Private Property—14. Manhole Marker at Side of Highway.

be abnormally high and that the operations would progress much more slowly. In view of this, no splaying was used.

The racks are set out from the wall to permit the splicer to make the splice without moving the cable out from the wall. Also, the cables are to be racked on 12-inch centers.

Loading manhole excavation was done by machine. In most cases the holes were carried to a depth of about 15 feet. Sheeting was used on all of them. A three-fourths-yard excavator, equipped as a clam shell, was used on the northern end of the job. The machine dug the center of the hole and hoisted the material removed from the sides. In the city of Albany it was emptied directly into trucks so that double handling was avoided.

Material around the sides of the hole had had to be removed by hand, and shoveled to a position where the bucket could reach it. A three-eighths-yard crane was used on one contract, and a small shovel equipped as a trench hoe on another. These machines were better adapted to the work than the clam shell because of their smaller size and greater ease of handling.

Line manhole excavation was done by hand throughout the job as the holes were not big enough to allow a machine to operate.

The trenching machine was used to dig a few manholes, but because of the demand for it in opening trenches, it was available for manhole work only a small part of the time. Sheeting was not, in general, required on these manholes, but shoring was used on about one-half of them.

Two systems of pouring manholes were used. On the two northern contracts, mixers were set up at central points and the mixed concrete was hauled to the manhole sites. On the two southern contracts, mixers were set up at each manhole site.

The use of the central mixing plant was very convenient in the city work as it reduced the amount of street space necessary for the construction operations. The setup in the city was used for all the work on this contract and about three miles on the northern end of the next contract. One other setup was used to complete the remainder of the second section.

The maximum haul was about six miles, most of this being over improved roads. The concrete and mortar were generally hauled in special trucks consisting of hopper bodies mounted on Ford chassis. Mortar was not seriously affected by the haul, but segregation appeared in the concrete, especially in the wetter mixes.

This was corrected to some extent by dumping the trucks into a receiving hopper and shoveling from the hopper into the forms. The concrete was remixed by hand where the segregation was too great. Some type of agitation would have been preferable for use on the extreme hauls over rough roads. Extreme segregation occurred in only a few cases but remixing by hand gave fairly satisfactory results.

Marking.

One concrete marker was set along the side of the manhole opposite the manhole cover at all manholes on private property. This marker was set with one face parallel to the side of the manhole and with about three feet exposed.

The manholes were numbered consecutively from Albany to Catskill with an additional serial number for each loading manhole. The pulling-in of the cable was started at the Albany end with cable reels numbered in the order in which they would be placed. The manhole numbers were stenciled on the concrete markers with standard black stencil paint using 2½-inch stencils.

Where the conduit was laid under the shoulder of a highway, one marker was set on the right-of-way line of the highway opposite the head. Numbers for manholes in these locations were stenciled on this marker. On the manholes under streets the number was stenciled on the side of the roof opening under the cast iron frame.

Manhole frames were drilled and two anchor bolts, set in the roof of the manholes, were used to hold the frames in place during pulling-in. The anchor bolts were omitted in manholes in the city where covers would be secured by sidewalks or pavements.

Where manhole heads were located in highway shoulders close to the pavement a concrete ramp was constructed to prevent erosion of the surrounding soil from leaving the head extending above the surface. These ramps consisted of a five-inch concrete slab with one edge level with the edge of the highway and the other edges curved down beneath the surface of the shoulder. A mason and helper, following the gang stripping forms, laid the collars and set and bolted the frames in place.

The racks, loading manhole decks and manhole markers were set in connection with rodding the ducts, to reduce the number of times the manholes had to be pumped out.

The first cable, of 2⅝-inch diameter, was installed and placed in service on May 1, 1930. Having reached this point, those intimately in contact with the progress of the work on the entire project are quite in accord in the opinion that in localities where the available highway routes are unfavorable from various standpoints, a private right-of-way route will frequently afford an attractive alternative.

Elimination of interference from traffic, particularly where high speed through highways would offer the only alternative route, is, of course, a feature worthy of consideration. Also, it was possible to take advantage of the flexibility the selected route afforded in avoiding the natural and man-made obstacles which would have presented themselves had the conduit followed a highway.

Conclusions.

It is true that the selection of the route followed introduced some new problems, but they were of minor importance in comparison with those which were avoided. Furthermore, the experience gained on this project will be invaluable in anticipating and providing for these new features when they are encountered on future projects.

In view of the foregoing, when new conduit routes through similar territory are contemplated, careful consideration will be given to the possible use of a route over private right-of-way as against construction on an existing highway.

A Completed Conduit Bridge with Steel Work Encased in Concrete on Albany–Catskill, N. Y., Toll Conduit Route. The First Cable Was Placed in Service May 1, 1930.

Prices in the Metal Markets.

New York, March 30: Copper—Easier; electrolytic spot and future, 9¾@10c. Iron—Steady; No. 2, f. o. b. eastern Pennsylvania, $16.50@17.00; No. 2, f. o. b. Buffalo, $15.50@16.00; No. 2, f. o. b. Alabama, $11.00@13.00. Lead—Quiet; New York, spot, 4.50c; East St. Louis, 4.25c.

Preparation for Emergencies Is Duty

Telephone Companies Should Be Prepared for Every Emergency—Some Practical Suggestions on Selection and Care of Emergency Stocks and a Few Ideas Regarding the Importance of Having Sufficient Stocks on Hand at All Times

By M. A. Bellion,

Manager, Supply Sales Department, Kellogg Switchboard & Supply Co.

Today the question no longer arises as to whether or not a telephone company should carry an emergency stock of supplies and materials. Past experiences have proved, time and again, that extra stocks must be kept at hand to maintain service, or the telephone company is certain to incur losses in revenue, subscribers, and good-will that cannot be regained.

Every progressive company should, and usually does, realize that an emergency stock is a form of inexpensive insurance against these losses, and that such a stock is a matter of absolute necessity. The problem of stocks then, is no longer concerned with the actual question of carrying or not carrying them, but rather with how much should be carried at any one time.

It is with a viewpoint of the quantity of supplies that the telephone company can carry to meet its need without involving too great an investment, that this article is concerned.

The quantity of supplies that must be maintained as emergency stock varies in accordance with several factors which differ with each individual company. Among these, natural conditions and the weather occupy an important position.

In arid or semi-arid sections, sudden destruction of lines by storms, sleet and washouts is exceedingly rare. In a similar way the slow, but none the less certain, destruction caused by moisture is largely eliminated. The company operating under these conditions is not required to carry a large emergency stock to protect itself from natural causes that in other places destroy large sections of lines in a few hours' time. A stock adequate to care for the usual replacement requirements only is needed.

Fire probably is the only real emergency that might arise, capable of widespread destruction. Woodlands or prairies are subject to fire, varying under specific conditions; and the company that has lines running through such territory must decide for itself the possible fire hazard and carry stock to meet such an emergency.

In other sections of the country, sleet is a constant menace from early winter to mid-summer. In these sections the wise telephone man has an emergency stock of wire, poles, crossarms and hardware sufficient to rebuild from 5 to 20 per cent of his plant. The amount of this reserve material depends not only on the size of the plant and number of stations, but also on its physical layout and condition.

For example, take a town of 3,000, with 900 telephones in service. It may be that 400 of these telephones are beyond the city limits and reached by open-wire leads. When this condition exists the telephone manager must have on hand a larger stock

Mr. Bellion Clearly Explains Why It Pays the Telephone Companies to Carry An Adequate Stock of Emergency Supplies.

of emergency material than the manager in the same size town in a different section where all but 40 of the stations are inside of the city limits. Rural telephone development, then, is also a deciding factor.

The condition of the equipment is still another factor. The company that maintains its lines and plant in good repair at all times—replacing poles and wires at the first indication of weakening—can safely carry a smaller stock than the company that waits for its poles to fall and lines to break before making replacements.

Incidentally, it is both "better business" and less expensive to replace equipment as soon as it shows signs of weakening rather than to wait for its actual failure. For one thing, the equipment must be replaced at some time or another anyway, and the cost of new material is the same whether it is bought now or later.

It takes a lot less time and money to replace poles during good weather than after a storm, when the weak ones have broken off and pulled all the wires down in a tangled mass with them.

And most important of all, substantial, well-maintained lines almost entirely eliminate the possibility of interrupted service, even during the worst kind of weather. In the same way, a newly laid-out line is far more substantial than an old line, and less emergency stock is needed to keep it up.

There are many exchanges which merely "switch" rural lines, farmers being the owners. In such cases, when trouble occurs, the exchange manager is looked to for help; and if he has material on hand to help the farmers out, he is making an investment in subscribers' good-will that will bring him dividends later.

Poles are subject to a lot of curious ailments, and a good pole yard located near a railroad spur track, well-drained, dry and kept free of rubbish or debris, is one of the assets every sizable telephone exchange should have.

The number and size of poles to be kept there is a matter of judgment. It depends not only on the total number of poles in the wire plant, but also whether or not it is in the sleet area, the age of the poles, the number of arteries and main travelled roads in each vicinity.

Roads and swamps are hazards. Sometimes automobiles travel at high speed around corners—and they do not always make it. A telephone pole is an ideal target. Why automobiles pick on poles is one of the unanswered questions of present-day traffic; but the fact remains that in four out of five accidents the telephone company suffers.

When accidents of this kind happen, it is usually the corner pole that gets clipped off and made ready for the kindling wood box. For this reason, keep several poles on hand suitable for the worst corners on your line.

Swamps ruin poles, not so much because of water, but because of fire. The burning of marsh grass every year burns off any number of good poles. To prevent this damage, telephone companies should try to keep the grass away from their poles as much as possible—cutting it back several feet and spreading a layer of sand and gravel around the butt.

This practice of prevention means the saving of a good many poles, which ordinarily are ruined during marsh fires. Several poles should be on hand to meet this emergency.

Lightning and woodpeckers are two hazards. Electrical storms split many poles from top to bottom, and new poles are necessary. This is another reason for having a few poles on hand. The little red-heads in some sections of the country are a real menace, cutting so many poles that the top of the pole breaks off in the first wind storm.

High wind storms and tornadoes are real factors in the ruining of telephone

poles, sometimes laying miles of them down on the ground without warning. Where wind storms or tornadoes are a frequent source of trouble, a greater number of emergency poles should be kept in the pole yards.

Some exchanges are fortunate, due to being located near large pole-supply houses and yards where quick service can be had. The source of supply then is the limiting factor in pole storage.

The foregoing comments also apply to crossarms, pins, brackets and all other items needed. The smaller items are inexpensive and may be stored easily. It is wise to have a good supply on hand at all times.

Rust or mechanical injury are the only foes of hardware. Bolts and clamps sometimes rust so badly that it is cheaper to use new ones than try to remove the nuts from the old. A quantity of all sizes of bolts and washers should be carried on hand; stored in bins, numbered and marked for identification. The emergency may be only the erection of a wash line for the "Missus" or setting up the community Christmas tree—but be sure to have them ready for that too!

Guy wire, strand, messenger and clamps are practically indestructible; but sometimes when the automobile misses the pole, it hits and breaks the anchor rod; or some mechanic's young son with a brand new hacksaw demonstrates on the guy or anchor rod. Some guy wire and a rod or two then are handy items to have in the storeroom.

Cable plants are not immune to trouble. When cable, with a thin lead sheath, has been buried underground without conduit or care, things are bound to happen. In that case there are three things to do:

First. Buy good cable.

Second. Put it in right.

Third. Keep short lengths of different sizes constantly on hand for repair work. Workmen digging up buried cable in frozen ground can easily ruin ten feet with two blows of a pick-axe.

Good underground cable plants in conduit require no attention unless an earthquake comes along. For this type of construction some spare duct might come in handy. Some sealing compound for manhole covers should be kept, and a periodic inspection should be made for loose covers. Seal them down and avoid damage suits!

If yours is a railroad town, or you have aerial cable near engine houses or factories where coal smoke is constantly in the air, it is better to put the cable underground, and in conduit when possible. If not, be ready to replace a whole span or two on short notice; lead cable sheath and coal smoke do not get along together.

Storage space for emergency material is also a very important part of each telephone company's preparedness plan. Primarily there are two major requirements for the storing of such material: outdoor or uncovered space, and indoor or protected space, each of which has a definite purpose.

A number of things to be kept on hand for emergency are:

Sufficient paraffin, beeswax, muslin, solder and sleeves for a "wet" cable.

One or two medium size cable terminals with stubs—lightning sometimes ruins a whole terminal, and it must be replaced.

Plenty of insulators, knobs and tubes.

A good supply of drop wire.

A bundle of soft tie wires—made up.

Plenty of wire and bar solder with **flux.**

A good supply of friction tape, also rubber tape.

Gasoline, for blow torches and furnaces.

A pair of rubber gloves for high voltage work—sometimes the telephone line gets mixed up with a power circuit.

And last, but most important—every man, every automobile, every room of every building should have—no, not a fire extinguisher, important as it may seem, but an emergency medical kit. These kits should be kept full *all* the time and placed in an easily accessible location so that anyone can find them at a moment's notice.

A human life is worth more than any telephone exchange—see that gauze, bandages, iodine or mercurochrome, salve and other standard articles which may prove handy, are in the kit.

Standard medical kits are now easily obtainable, and they should be the first thing on the list of supplies for emergency. In some states, a small snake-bite outfit should be supplied the telephone lineman or crew.

In an article of this kind all the points cannot be brought out. There are, for instance, cases of snow-blindness on record where a lot of suffering could have been saved the lineman had he been supplied with colored or smoked glasses.

There are many cases of electrocution where a small pulmotor could have saved a life. In this regard, *it is assumed that every telephone man has been taught artificial respiration* and knows how to put the breath of life back in a fallen comrade. That is storage of knowledge, and costs nothing.

Another incentive for having proper storage space and sufficient material on hand is the fact that during the regular construction of pole lines, aerial or underground cable, and installation of subscribers' stations, much material needs to be used. Such material, when stored correctly, is actually an asset to the company in many ways.

It is very important that all material necessary for such construction jobs be on hand before the work actually starts since most of the expense of such a job is labor, and it costs money to have a crew of men and a truck lying idle waiting for poles, wire, hardware and other material to arrive from the factory.

If you have a problem of storage of any kind, or want to know more about any of the matters referred to, write and I'll be glad to supply you the information.

The Outside Telephone Plant Records

Broad Principles to Which Any Workable System of Outside Plant Records Should Conform—Small Exchange Records—Cannot Be Effective Unless Routines Are Established—Address at Meeting of Northern Indiana Association

By G. C. Reisner,

Plant Engineer, Indiana Bell Telephone Co., South Bend, Ind.

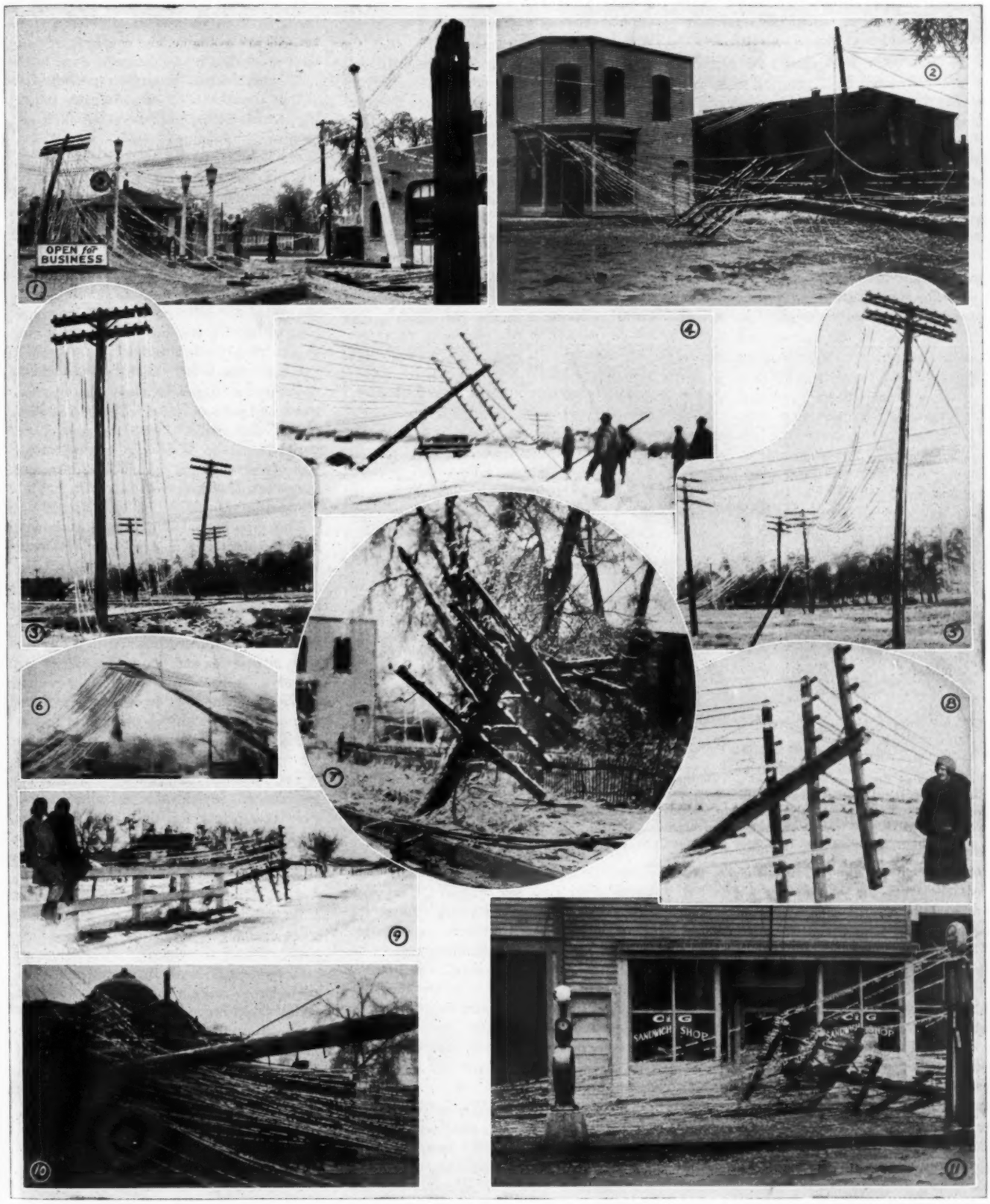
The necessity for adequate plant records, kept up to date, has been recognized as fundamental by practically all telephone companies. Directly or indirectly, they affect nearly all construction activities. They are the tools used by the plant engineer in performing his work, in the design and operation of the telephone system. They furnish him with the information, on which are based the recommendations for replacing existing plant and are indispensable to economic design of new telephone plant.

In inventory work, they provide a location record of the entire outside plant; in addition, for many classes of plant, they provide all the data necessary for the development of a complete inventory. For the cable maintenance and other maintenance forces, they provide records, with the aid of which troubles are tested and accurately located.

In the case of storm breaks and other casualties, they furnish information essential to the prompt restoration of service. They furnish at all times a record of the location of the company's outside plant property, and serve as an indication of the company's ownership of that property.

The outside plant is widely scattered and is made up of many dissimilar units. The requirements which must be met in a record of this plant are diverse. The records in any plant, large or small, should

Sleet Storms Call for Emergency Stocks



Following Sleet Storms Emergency Line Material is Always in Great Demand. The Illustrations Show Some Results of November, 1930, Sleet Storms Which Swept Across the Territory of the Northwestern Bell Telephone Co., Touching Upon Four of the Five States in Which it Operates, and Leaving Damaged Lines in Their Wakes. The Center Illustration (No. 7) Shows the First Section of Pole and Crossarm to Fall from the Tremendous Weight of Ice on the Wires of the Northwestern Bell Company's Toll Lines in Morehead, Minn. Views Nos. 1, 2 and 11 Show Similar Crashes in Fargo, N. D., and in Morehead, Minn. Scenes Near Broken Bow, Neb., Are Shown in Views Nos. 4, 8 and 9. The Lines Shown in Views 3 and 5 Are Located Near Crookston, Minn., and Nos. 6 and 10 Are Other Scenes from the Fargo–Morehead Section.

be designed to meet these requirements adequately, but without unnecessary duplication of records. In determining their compass, the following broad principles are given, to which any workable system of records should conform:

1. Only such data should be recorded as are warranted by frequency of use or which, though less frequently used, can be determined only at the time of construction.

2. Records should be so designed as to require the minimum amount of effort, in both their preparation and their use. Greater stress should be laid on the standpoint of use, since it will prove economical to be liberal in the preparation of records, if by so doing the efficiency of the plant operations is increased.

3. The best results will be obtained when the records are designed for record purposes only. The requirement of records and work plans, with few exceptions, are so different that the same plan cannot be used efficiently for both purposes.

4. There should be only one record of each item of plant, unless the decidedly dissimilar requirements of different employes warrant partial duplication of original records.

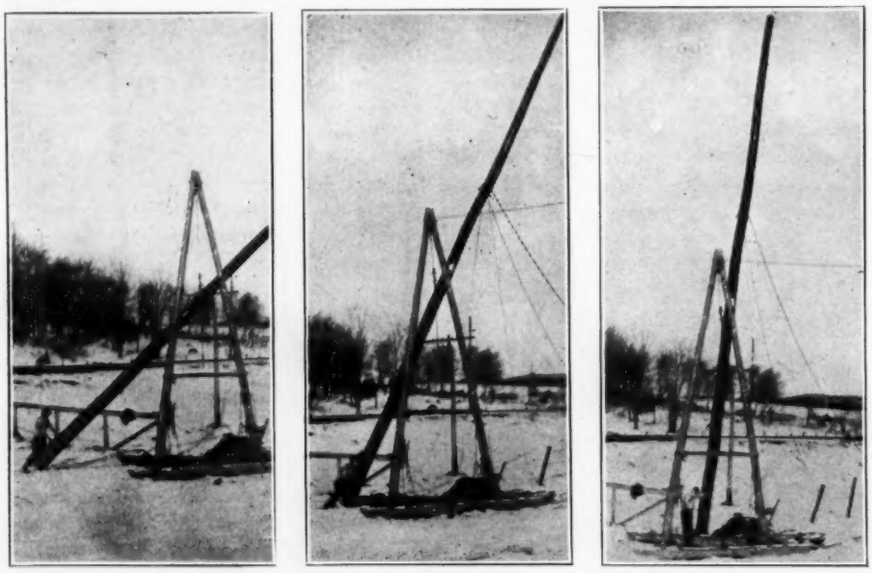
5. To get maximum value from the records they should be in such form that prints of them can be readily and cheaply made for all those who can use the records to advantage.

6. The detailed records should be prepared in such form as to emphasize the plant and to subordinate the geographical features.

An adequate system of records can be set up, in accordance with the foregoing named principles; but these records cannot be effective unless routines are established within each organization which will provide for: First, transmitting to those who maintain the records prompt and accurate reports of the work done; and second, prompt posting of the records to show all current changes and additions.

Normally, the responsibility for the preparation and upkeep of the records rests with the plant engineers, while the construction and maintenance forces are usually held responsible for securing the record data, relative to all plant additions, removals or changes made by them. These data should not be secured by a special force, but by those men who do the work, at the time they are doing it, and be reported on the plans from which they work.

Work plans, which need not necessarily be a work of art, just as long as they are clear and legible and above all means accurate, provide a means for reporting the record data. With adequate routines stipulating what data are required, the problem of securing complete and accurate reports becomes one of supervision only, and the expense of obtaining these reports becomes the smallest possible. The routines which are established to cover the foregoing should include definite provision for getting the reports from the field to the plant engineers or record department, and for assuring their receipt by the record department.



Three Views Showing Erection of a Telephone Pole by the Use of a Derrick Rig Especially Developed for Use on Ground Too Soft for the Heavy Pole Digging and Pole Setting Machine to Work on. This Construction Covers Work of Michigan Bell Telephone Co. in Northern Michigan Last Year. Due to Highway Rebuilding and Widening It Was Necessary to Raise the Toll Pole Line So Steam Shovels Could Work Under It.

The question now naturally arises as to just what records are necessary for the successful operation of the small telephone exchange, let us say exchanges between 500 and 2,000 stations. We will say that the answer to this question will be that the records need not be possibly as elaborate or comprehensive, but that those records that are kept at all should be just as complete and accurate as those which are kept for the larger exchanges.

We cannot place too much stress on the accuracy of plant records. Unless these records are kept accurately, it is just as well, or possibly better, that no attempt be made to keep records at all; since if no records are available, any checking of plant data must then of necessity be done in the field where actual conditions prevail.

It is recommended then that the following records be kept for the small exchange, as previously defined:

1. Pole record.
2. Aerial cable record.
3. Rural pole and wire record.
4. Underground conduit record.
5. Underground cable record.
6. Outside plant map.

A small scale street map of the exchange, of about 200 feet to the inch scale, should prove satisfactory in the preparation of the record pole map. This map should show the location of all poles within the base rate area. Each pole should be designated as to height, class, timber, treatment and age of pole. Example, "30-ft. class C, butt-treated, western cedar, 1929," indicates a pole 30 feet in height, class C with respect to top and butt dimensions, butt-treated with respect to treatment, and set in the year 1929.

This map should contain a title, showing scale of map and date of preparation, as well as a specified space for all revision dates. It will serve for pole inspection, a geographical guide to right-of-way and joint ownership records, as well as a detailed location record, for use in connection with inventories and tax purposes. It also serves as a basis for various engineering studies, such as the determination of the average life of the pole plant, and in connection with the preparation of orders for the replacement of defective poles.

The combined aerial cable records, which includes all aerial cable on one, or possibly two prints for the entire exchange, can be used for exchanges of any size. It is better adapted to small cable systems in which revisions are relatively infrequent and the cable trouble is not handled from a central locating bureau, as in a multi-office exchange.

In exchanges where the underground cable system is small in extent, it may be advisable to make a joint underground and aerial cable record. The data to be entered on such a joint record would be the same as those required for the combined records of these two types of plant. It would, therefore, be unnecessary to make a separate underground cable map.

The aerial cable map should show all aerial cables and cable terminals, by size, in pairs, gauge and count (in pairs) for each cable and terminal. In addition, each cable terminal should be designated either by street address (preferable), pole number or an indiscriminate terminal number.

Each cable should likewise be designated by a number and the year of installation, and cumulative lengths should be

shown from the central office or underground terminal to each aerial terminal splice, each taper splice, and other splices of importance to the plant engineer and cable testman.

The purpose of these measurements is to assist in locating cable troubles, as well as for taxing and inventory purposes, and for various engineering purposes. The map should show township boundaries and base rate boundaries, in case the cable extends beyond one township or the base rate area respectively. This cable record map should also contain a title, showing date of preparation and a separate space for revisions.

Rural Pole and Wire Record.

A printed form on tough, translucent paper, slotted for binding in a loose leaf binder, should be used for the rural pole and wire record. Telco blueprint bond substance No. 13 or an equivalent paper is recommended for this purpose.

The form should be so printed that when bound in the loose-leaf binder, the data will appear on the left-hand page. The pole numbers and location diagram will then appear at the outside edge of the record. The size of the sheets should be 8½ ins. by 11 ins., which is standard letter-size paper.

As on the city pole record, this map or sheet should also designate each pole, with respect to height, class, treatment, timber and age of pole. A second sheet can be placed opposite each first sheet in the loose-leaf binder, which can contain columns for replacement of poles, crossarms, insulators, the resetting of poles, trimming and cutting trees and brush, etc.

This will give a running record of each pole line, and the lines can be checked in the field, either riding or walking, without having the map blow all over creation, as would be the case with a larger size print.

The open-wire record can be shown opposite the pole record on these forms, showing the beginning and end of each circuit, as well as the drop wire to subscriber locations, by pole numbers. This map serves a very useful purpose in assignments for new subscribers, as well as for checking the subscriber loading of each circuit. It also serves for engineering, taxing and inventory purposes.

If desirable, the open-wire record can also be made on a separate map, which can be made on a cardboard form similar to the cable book records, and bound in book form. This record can then be used and kept up to date by the wire chief or testboard man from the completed service orders or work orders.

This map will show each circuit, and each drop wire, designated by telephone number and shown as to location by pole numbers.

The underground conduit record should be made at the time the underground conduit is placed, since practically all of this type of plant, outside of manholes, is not accessible after the construction work is completed.

Because of the long life of the conduit system, the descriptive records should be in such form as also to be long-lived, and the data should be in such form and terms as will be readily intelligible to future employes.

The conduit record should show dimensions and type of material used for all manholes, also type of manhole frame and cover. The cross-section of each section of conduit between manholes should be shown, together with the wall-to-wall section length and minimum and maximum amounts of earth cover over the conduit. The kind of material and any protective covering for the conduit should be shown. Any major obstructions encountered during construction should be shown on the record print.

This record also serves for taxing, inventories and various engineering purposes, in addition to plant maintenance purposes.

As previously noted, the underground cable record should be shown on a combined aerial and underground cable record. It should show all cables and cable terminals, by numbers, sizes, gauges and cable pair counts, for each cable and cable terminal.

Manholes should be shown on this record, and wall-to-wall section lengths of cable, together with cable measurements inside of manholes, as well as between manholes and lateral poles.

The outside plant map should show the location and extent of the major items of plant in an entire exchange, either on one or two prints. This record is primarily for the use of the plant engineer in determining the most economical plan of providing outside plant facilities as they become necessary.

It also serves as an "assignment map," for the purpose of associating service orders and assigning cable pairs to the proper aerial cable terminal. It can also be used as a key map for new outside constructive work, showing the relation of the new work to the existing plant.

This map shows all street lines. The underground conduit and cable, as well as the aerial cable and aerial cable terminals, are all designated by distinctive codes.

The aerial cable terminals are preferably designated by street addresses, in order to allow the map to serve more effectively as an assignment map. To this map, the wiring limits for each aerial cable terminal can also be added, which show the minimum and maximum street numbers in the area surrounding each cable terminal to which new service orders can be assigned.

Nebraska Construction Plans

Lincoln Company Will Probably Spend One and a Half Million Dollars in Replacements and Extensions—Northwestern Bell to Spend About Four Million in Nebraska and South Dakota

Business conditions in Nebraska are better than in many parts of the country and should, therefore, return to normal sooner. The Lincoln Telephone & Telegraph Co. has adopted a policy for 1931 consistent with general business conditions, with proper consideration for favorable local conditions.

During the year the company plans an expenditure of approximately $1,000,000 new construction, J. H. Agee, general manager of the company, has announced. In addition to the construction expenditures for extensions and replacements planned for 1931, there will be spent approximately $1,200,000 for maintenance and operation for the company's service in its territory, making a total expected expenditure of approximately $2,200,000.

Further facts gleaned from the 1931 budget figures indicate that, while a large portion of the 1931 appropriations will be devoted to expanding and replacing outside plant facilities, it is also planned to expend $175,000 for central office facilities.

Approximately $70,000 will be expended for the building construction program in 1931. In addition to new central office buildings at Lincoln, Seward, Humboldt, Denton and Raymond, considerable remodeling will be done in order to make present locations more convenient for both the public and the company's employes. The approximate figures for expenditures for central office equipment in 1931 indicate that $120,000 will be expended for manual equipment, while $48,000 is estimated for automatic equipment.

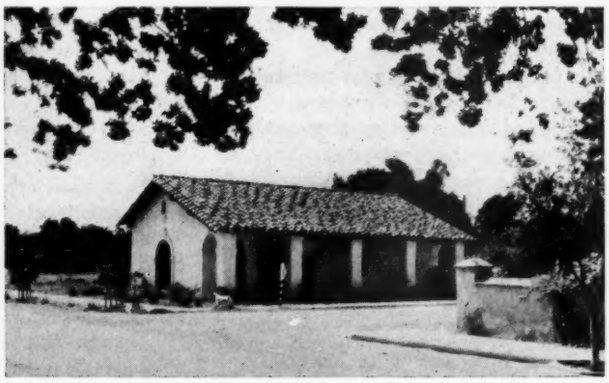
Material required for the year under the program will include 25,000 poles, 1,500 miles of copper wire, 15,000 crossarms, and 24,000,000 conductor feet of cable.

The Northwestern Bell Telephone Co., Omaha, Neb., is undertaking a construction program in the Nebraska-South Dakota territory which calls for a gross expenditure of $4,226,000. The five-year average expenditure in this area has been $2,815,000, making a substantial increase in the amount to be spent during the ensuing year.

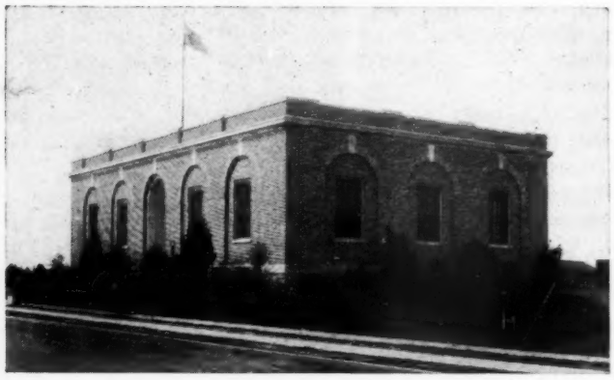
The Northwestern Bell company's budget for the entire territory which it serves—Nebraska, South Dakota, North Dakota, Minnesota and Iowa—calls for a gross expenditure of $15,625,000.

The Pierce Telephone Co., Pierce, Neb., expects to spend $1,800 on improvements to its plant during the ensuing year.

A PAGE OF TELEPHONE BUILDINGS TYPICAL OF THE SMALLER EXCHANGES OF THE BELL COMPANIES.



New England Telephone & Telegraph Co., Scituate, Mass.—Pacific Telephone & Telegraph Co., Ojai, Calif.



Pacific Telephone & Telegraph Co., Ventura, Calif.—Southern Bell Telephone & Telegraph Co., LaPlace, La.

Cincinnati & Southern Bell Telephone Co., Glendale, Ohio—New York Telephone Co., Armonk, N. Y.

Southern New England Telephone Co., Manchester, Conn.—New York Telephone Co., Mamaroneck, N. Y.

Merits of Quality Telephone Drop Wire

General Opinion of Experienced Telephone Men Regarding Importance of Quality in Drop Wire—Merits of Drop Wire Based on Three Characteristics—"Home-Made" Tests for Tensile Strength—Insulation of Drop Wire Highly Important

By L. V. Anderson,
American Electric Co., Inc., Chicago

Recently a telephone man was questioned by a friend, who often had occasion to be in his office, as to why he was such a crank about quality in drop wire. The friend insisted the quality argument applied to most products was over-emphasized. He went on to intimate that in the case of drop wire, for example, a good price consideration would more than balance the lack of quality.

"My friend," bristled the telephone man, "your arguments in this case only prove two things: First, that you know very little about the telephone business; and second, that you know nothing at all about drop wire.

"If there is one thing that my 30 years of experience has taught me, it is that 'nothing is apt to cost so much as a drop wire which costs so little'—if I may be permitted to paraphrase the slogan of a well-known bearing company."

"Furthermore," he continued, "I could not afford to use low quality drop wire if you gave it to me—even if you placed it in my warehouse free of charge."

Seeing the incredulous look on the face of his friend, he pulled out his pencil and put down the actual figures of installation cost, cost per year, repairing time—and in the end, he proved his point.

This conversation illustrates the general opinion of experienced telephone men regarding the importance of quality in drop wire. Rarely will a telephone manager be found today who is willing to compromise quality for a price consideration when purchasing drop wire. It must be understood, of course, that high price cannot be taken as an index of quality. Merely because it sells for a quality price, it does not necessarily follow that the drop wire contains quality characteristics.

To actually define "quality" with reference to drop wire, it is necessary to fall back on our old friend "Specifications." It is the purpose of this article to aid telephone men in establishing modern drop wire specifications in the light of present day scientific knowledge and research.

Fundamentally, the merits of drop wire are based on three characteristics:

1. Its ability to transmit voice currents from cable or pole lines to the subscriber's premises.
2. Its ability to withstand the stresses and strains of high winds and sleet snows.
3. Its ability to accomplish the foregoing steadily over the longest period of time.

Translated into telephone terms, these characteristics are known as conductivity, tensile strength and insulation. Obviously, any drop wire, however poor, contains these qualities to a certain degree. We are not concerned with relative qualities, however, but are seeking the best, as under actual conditions only the best will do.

"It Must Be Remembered," Says Mr. Anderson, "That a Good Conductor with Poor Insulation Makes Worthless Drop Wire."

Lest the reader take exception to this, let him consider the recent experience of one telephone manager. This man believed in the economy of quality drop wire, but upon being shown average weather statistics, he made a compromise on breaking strength and purchased a drop wire which was high grade in all other respects.

Unfortunately, three months later, this particular section of the country was visited by a violent storm that exceeded any in the entire history of the weather bureau. The result was that the fairly high grade drop wire was not good enough. Again it was proved that drop wire must provide the maximum amount of protection, and that the purchase of any but the very best is false economy.

In the early days of telephony, strength was the prime factor in drop-wire selection, and conductivity and insulation merely secondary features. Because transmission standards were comparatively low, it mattered little what the conductivity was, provided the drop wire was strong. With the betterment of transmission standards, however, the relative high resistance of these strong drop wires became a problem. To be sure, when necessary, wires of high conductivity could be used, but these were of such low tensile strength as to be totally unsatisfactory when exposed to adverse weather conditions.

Improved manufacturing processes and scientific research solved this problem however. Today, every drop wire at all worthy of the name quality has a high degree of conductivity. While it is true that competitive claims are made as to the relative conductivities of "quality" drop wires, it should be remembered that only conductivity equal to that of the cable is necessary. For this reason, a telephone manager who specifies a quality drop wire may feel certain that the conductivity will be more than satisfactory.

Having disposed of this problem, the cycle again returns today for the search for the strongest among these high conductive drop wires. Unfortunately, the term "breaking strength," which is often employed in specifications of drop wire, is not always a true criterion. For example, two wires whose specifications have the same breaking strength, may vary to a considerable degree as no standard for a maximum or minimum has been established.

Perhaps one manufacturer may quote a breaking strength as meaning a maximum throughout any length. Another will quote the same figure as meaning an average breaking strength of short length samples. When confronted with these seemingly conflicting claims, the buyer himself is the sole judge.

If he is a buyer of drop wire in large quantities, it is advisable for him to have laboratory tests made to find out for himself which is the strongest. If he does not have the facilities, there are commercial laboratories in nearly every large city that will give unbiased reports for a nominal charge. If this seems to be considerable trouble, it must be remembered that the extra margin of safety provided by the strongest drop wire may be worth thousands of dollars in a severe sleet storm.

Obviously, it is impractical for the telephone man who uses drop wire in limited amounts to carry the testing to this length. There are, however, several "home-made" tests which can be easily applied and which will give an approximate valuation of strength of various drop wires.

One of these is the "bending tests." For this test, short-length samples of various drop wires are selected. By taking each of these and bending them back and forth and counting the number of bends in each case until the wire breaks, a fairly good idea may be obtained as to the relative strengths.

Insulation Qualities.

By discovering for himself which is the strongest drop wire and dismissing the question of conductivity as not being an issue—as all quality drop wires have a high degree of conductivity—there is but one other characteristic of drop wire that must be gauged by the purchaser, and that is insulation. Although the braiding is ordinarily considered a part of insulation, the true insulating properties are contained almost entirely in the rubber compound.

A close braid of fine cotton, thoroughly saturated with a weather-proofing compound and covered with a coat of finishing wax, will tend to preserve the rubber, it is true, but it cannot preserve something which is not there originally. It will, however, prolong the life and usefulness of a good rubber compound.

The importance of high quality rubber compound cannot be stressed too much. After all that has been said regarding the necessity of an excellent conductor, it must be remembered that a good conductor with poor insulation makes worthless drop wire.

A high quality rubber compound must not show leakage under adverse weather conditions, such as extreme cold, heat, moisture or coatings of sleet. It should be able to withstand the sun's rays without undue ageing; and above all, it should maintain its insulating properties over a period of years.

It is to be regretted that there is no simplified method by which the purchaser may determine the quality of rubber compounds used in insulating drop wire. Facilities for carrying on laboratory tests are not available to the man in the field. In the final analysis of rubber compound, it is wise to base one's judgment on properly conducted tests made in testing laboratories.

Three Simple Insulation Tests.

There are some tests, however, which, in the absence of better guides, may be made by the man in the field. These are known as the "stretch," "toughness" and "tear" tests, and they are carried out as follows:

STRETCH: Slit a section of the rubber from the conductor, by laying a sharp knife blade, or an old razor blade flat against the conductor. A section about three inches long should be used. Place two pencil marks about one inch apart. A good compound should permit these marks to be stretched to about four inches.

TOUGHNESS: Stretch the same section to break. A good compound will give a snappy break and sting the fingers. A poor compound will break without effort and be dead.

Place the section on a hard surface and inbed the thumb nail in it. A good compound will not easily cut or crumble when scraped with the thumb nail. It will come back to practically its original shape and dimensions, and leave only a faint impress of the thumb nail.

TEAR: Split a section of the insulation and slowly tear it. It will give definite resistance to tear.

It should be remembered that in these tests only a sharp knife should be used; otherwise the stretch and toughness tests are all tear tests.

Value of Laboratory Tests.

When it is possible, of course, laboratory tests should be made and extreme care should be taken that the results clearly indicate the life expectancy of the compound. Too often, specifications on drop wire rubber are based on resistance to crushing loads, or what is known as the penetration test—in addition to a wrapping test. However, the penetration and wrap are not fundamentally rubber tests and, therefore, cannot predict how the compound will stand up in service.

The penetration test involves material known to possess a tensile strength. The wrap test is made to determine flexibility, but when the insulated conductor is merely wrapped on its own diameter, the outside of the rubber insulation is elongated only 20 to 30 per cent. Even a code stock of rubber is required to have elongation of 200 per cent and an ordinary rubber band will stretch 1,000 per cent.

Laboratory Tests of Rubber.

As may be readily seen, the penetration and wrap tests give no consideration to the actual physical properties of the rubber, the ageing of the compound, or its electrical insulating potentialities. To obtain a true estimate of the qualities of rubber compound, laboratory tests should be made for the following characteristics.

(a) Modulus of elasticity (measure of hardness).
(b) Tensile strength.
(c) Elongation or stretch.
(d) Recovery or set.
(e) Ageing.
(f) Electrical characteristics.

A high quality compound supplied on drop wire should contain these characteristics to the following degree:

Characteristics of Rubber Compound.

(a) Modulus of Elasticity: Inasmuch as modulus is a measure of hardness, the proper compound will be one that shows a high modulus figure for low elongations, yet will give a high elongation at rupture. A high quality compound should show a tensile strength of 200-250 pounds per square inch at 100 per cent elongation.

(b) Tensile Strength: The resistance to breaking loads, or tensile strength, should show a minimum of 750 pounds per square inch on the plain rubber.

(c) Ultimate Elongation: A two-inch section of the compound should stretch to eight inches without rupture. This is an elongation of 300 per cent and insures a high margin of safety for the wrap test.

(d) Recovery or Set: Although this property does not have any decided bearing on telephone wire, the compound should have a recovery of 3/8ths of an inch; that is, the compound should be capable of being stretched from two inches to six inches and recover to 2 3/8ths of an inch.

(e) Ageing: In addition to the foregoing tests on the rubber, there is another characteristic to determine, which is of the utmost importance. No matter how good the other tests may look, the important question is: How long will the wire give service?

For this test a Geer oven and an oxygen bomb (or equivalent) are required. The compound should have a tensile strength of 600 pounds after 96 hours in a Geer oven operated at 70 degs. Cent. and a tensile strength of 500 pounds after 48 hours in an oxygen bomb operated at 70 degs. Cent. with 300 pounds oxygen pressure.

(f) In testing the insulating qualities, the wire should be given a dry test of 10,000 volts. In addition to this, it should be immersed in water for 12 hours and then a second test of 1,000 volts given. This is to test for continuity of the insulation.

While the wire is still immersed, a megohm reading should be taken. The rubber should have a megohm resistance of 1,000 megohms per 1,000 ft. at 60 degs.

Conclusions

The compound should meet the following requirements:

Tensile strength—750 lbs. per sq. in.

Elongation—2 ins.-8 ins.

Recovery—2 ins.-2 3/8 ins.

Ageing—(a) After 96 hrs. in Geer oven at 70 degs. Cent., minimum of 600 pounds tensile strength. (b) After 48 hours in oxygen bomb at 70 degs. Cent. 300 pounds, minimum of 500 pounds tensile strength.

Test voltage—1,000 volts after 12 hours' immersion.

Insulation resistance—1,000 megohms per 1,000 ft. at 60 degs. Cent.

If the foregoing tests for strength of the conductor are made, if the tests for quality rubber are adhered to, and care taken to obtain the required degree of conductivity in the wire, the telephone manager can feel certain that his drop wire troubles have been eliminated so far as is humanly possible.

Good Wire Installatin Pays.

Care must be taken, of course, in the installation, and every precaution taken to avoid chafing of the wire. Knobs should be used to support the wire adequately along the building. A good installation of high quality drop wire will pay big dividends in bettering service and lowering maintenance costs, and in the end will prove the most economical.

The Correct Anchoring of Pole Lines

Anchor Expense Small in Comparison with Total Construction Costs and Also Damage Which Use of Proper Anchors Prevents—The Dead-Man Anchor—Types of Patent Anchors; Their Uses and Holding Power—Installation Hints

By A. B. Chance,
President, Chance Co., Centralia, Mo.

The anchorage of any pole line, whether it be telephone, telegraph, or high tension line, is probably the greatest factor in determining its life, strength and security. Corners and angles must be encountered, and terminals must be built. In this work particular care must be given to the anchoring of leads, or enormous expense and loss of time will follow.

The anchorage of pole lines may be compared in one way to the foundation of any modern office structure. The engineer in charge of building any skyscraper would be regarded as foolish to go forward with construction on a poor foundation. The structure would hardly be more than started until the foundation would crumble, resulting in disaster. Should a modern building be completed on an unreliable foundation, the forces of weather, or just ordinary depreciation, would soon bring out the weakness of such engineering practice.

The same principle holds true in anchoring pole lines. The anchorage in reality is the foundation of the lines. Once installed, the anchors are not seen from day to day as in the case of the other parts of the line. So far as inspection is concerned, the anchors are practically forgotten after installation, which is more reason that while being installed careful attention should be given the anchorage of any line, no matter what its size may be or what load it is expected to carry.

Anchorage Costs 3 Per Cent.

The difference in the cost of poor anchorage and good anchorage is small at the time of installation; in fact, a check of the anchor costs on the average telephone, telegraph and electric line shows surprising figures.

The cost of anchors is exceedingly low; in comparison with the remainder of the line construction it is often less than 3 per cent. It should be easy to see what this 3 per cent represents in the maintenance of the line. It is the security and protection of the remaining 97 per cent invested. If the anchorage fails, the lines go down, necessitating the time and expense of rebuilding, re-guying and re-anchoring the entire line.

In many cases where this occurs, the failure can be traced directly to the size of the anchor, it being too small or the kind not best adapted to the formation of the earth or location of the line.

The holding power of an anchor depends upon its area, and the resistance of the earth against which it pulls. The old dead-man is referred to as that type of anchor, but it is not provided with special means of contact with undisturbed earth.

The dead-man does pull against a certain amount of solid earth when placed in an undercut in the pit, Fig. 1. But the digging of this undercut, in addition to the large hole necessary for the log, requires so much extra time that many companies have abandoned this type of anchor. Only a small rim of the undercut, even if it is cut to a depth of half the diameter of the dead-man, is within the arc of the load circle. The penetration of moisture softens the rim, causing the anchor to creep.

The dead-man is commonly made of a wooden slug, a concrete block, disks, cross planks and the like. Considering the time element alone, it is a great expense when compared to the modern patented anchor; also there is a greater possibility of creepage with the dead-man type. Any anchor that creeps, regardless of the fact that it may not be more than two or three inches, has failed.

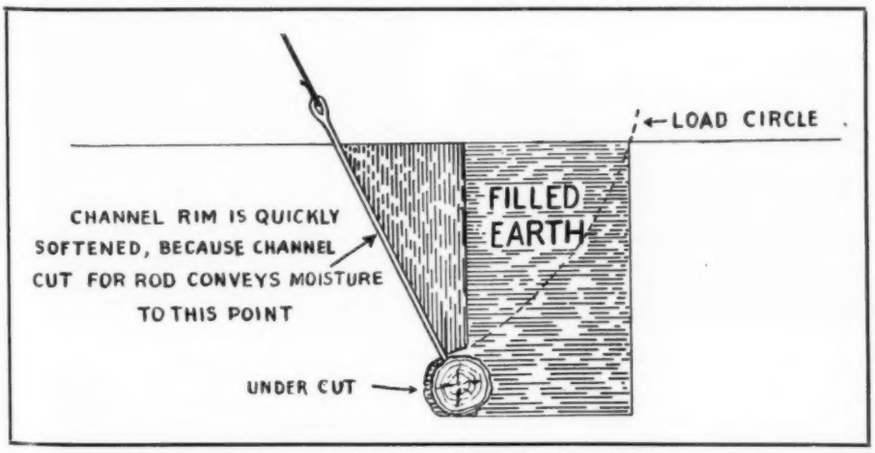

←LOAD CIRCLE
FILLED EARTH
CHANNEL RIM IS QUICKLY SOFTENED, BECAUSE CHANNEL CUT FOR ROD CONVEYS MOISTURE TO THIS POINT
UNDER CUT

Fig. 1. Dead-Man Placed in an Under-Cut. This Method of Placing the Log Anchor Requires Additional Time and Labor. Unless the Cut Is Very Wide the Anchor Will Creep Along Line of Load Circle; Also, This Channel Rim Is Quickly Softened, Since Channel Cut for Rod Conveys Moisture Into the Ground.

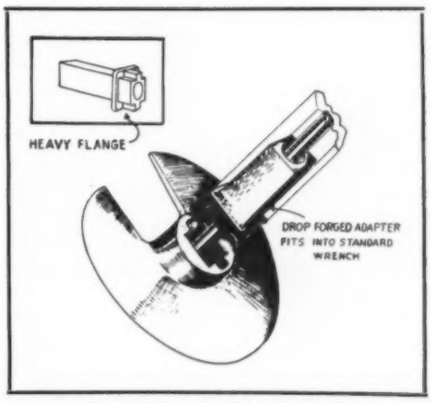


Fig. 2. Drop Forged Adapter Made to Fit Into Standard Screw Anchor Wrench—This Adapter with Its Heavy Flange on Either Side Fits Into Socket of Screw Anchor, Preventing Wrench from Splitting or the Square Shank Becoming Worn.

The creepage of an anchor is amplified in a greater movement at the top of the pole, and the line sag reflects the movement.

Patented anchors possess greater holding power than the dead-man, the installation is simple, and the strength and security of the line are increased. The principal reason for this increased holding power is through the design and construction of the patented anchor, enabling it to secure a firmer grip on undisturbed earth. Only a small hole is required for the installation, resulting in a great saving in labor and cost.

The most common types of patented anchors now manufactured are the screw, cone, expanding and plate anchors.

Screw Anchors Economical in Swamps.

Screw anchors are well adapted to light guying, and for such installations where it is desired to carry the line ahead. This anchor is used widely in swamp regions where moisture reaches to a great depth, and where it is practically impossible to install other types. For rural telephone lines and light electric lines, screw anchors are efficient and will be found economical in use.

New uses, however, have come in for the larger sizes, commonly known as the "swamp" type. These range in size from

8 to 15 inches, using a pipe instead of a rod. This is about the only type anchor that can be successfully used in the swamp regions. When installed at depths of ten to 30 feet by adding section to section in screwing down, the weight of the earth on top will give reasonably good holding power.

Occasionally during installation of the screw anchor, considerable difficulty is encountered when the ordinary square-shank pipe wrench becomes worn. A recent improvement over the ordinary wrench is the use of a heavy drop-forged steel adapter with heavy flange. The adapter is furnished with the anchor and fits the standard installing wrench.

This new type of socket prevents the shank of the wrench splitting or turning on the anchor. The socket type, using a wrench adapted to its engagement, Fig. 2, appears to overcome the trouble found in the ordinary square shank type.

The screw anchor ranges in size ordinarily from 6 to 15 inches. It is recommended for loads ranging from 2,500 pounds to 13,000 pounds in sandy soil; 3,500 pounds to 14,500 pounds in clay; 4,000 pounds to 15,000 pounds in hard pan, and 1,500 pounds to 11,000 pounds in swamp regions.

Rarely will the recommended load be placed on any anchor in actual use, these recommendations having been supplied through time tests. The test, when properly conducted, is a reasonably accurate method of arriving at the holding power of an anchor; but too frequently tests are made before the anchor has been allowed to become firmly set to the earth.

Cone anchors are intended for use in rocky earth formations and for all locations where moisture does not penetrate the earth very deeply. The walls of the hole must remain hard to resist the movement of the rock wedge, or the anchor will creep.

This type of anchor was founded on the theory of the "inverted wedge." The anchor is installed in a required size hole, and the rock is tamped around it. As the strain is applied, the rock wedging between the cone and the wall of the hole locks the cone in a secured position.

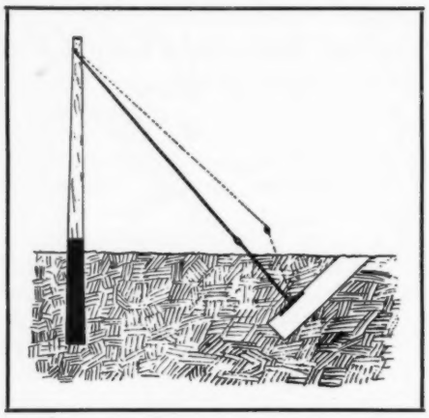


Fig. 4. Plate Anchor Correctly Placed. Dotted Line Indicates Installations Found in Many Places. Unless Line of Strain Is at Right Angles to Plate Anchor, Rod Seeks the Direct Strain, Causing Line to Sag.

Fascinating load results have been shown in tests with this anchor, made, however, at the time of installation. Some cones have pulled as high as 20,000 pounds; but when water soaks through the walls of the hole, the rock no longer offers resistance to the wedge and the anchor creeps to a point where the pole is carrying the load.

Cone anchors perform very efficiently and are economical if used as recommended, in such locations and earth formations where the walls of the hole are never softened by moisture, Fig. 3. They are best adapted to sandy soil and rocky sections. Cone anchors range in size from 6 to 23 inches and will carry loads in correct earth formations to 30,000 pounds.

This anchor can usually be installed at a 50 per cent saving over log anchors. The larger sizes, 16-inch, 19-inch and 23-inch, are even more economical when used with pole-digging machines, as the bits of this machine do not have to be changed to use it. The cone anchor, however, should be of the same diameter as the hole, in order to secure the full wedging effect of the tamped rock.

In the larger sizes it is recommended to first pull this anchor hard, either with a jack, winch or pulley blocks, to firmly mesh and wedge the rocks, before installing the guy.

The effectiveness of expanding anchors in telephone pole line construction or any other pole line work depends upon the expansion of the anchor in the ground. This anchor must be used in earth formations that will permit the anchor to expand without injury to the plates and other parts that may be subjected to severe tamping.

Expanding Anchors Used Widely.

Several types of expanding anchors are now used in telephone and electric pole line construction. This anchor has been accepted by many large companies as one of the most satisfactory types.

The expanding anchor is made in the two-way, three-way, four-way and five-way types, built to withstand strains from 1,500 pounds in sand to 32,000 pounds in hard pan. The expanding anchor until recent years was made of malleable iron by almost every manufacturer. Steel is being used now quite extensively in this anchor.

One of the most recent developments has been the introduction of copper-alloy steel to offset the chemical reactions of sulphur in the earth. Expanding anchors made of steel can withstand very severe punishment, which is often necessary in expanding the anchor in hard earth, without resulting in any injury to the anchor.

In rebuilding lines it is desired in many cases to salvage the rod from anchors that have been in the ground for some period. The nut retainer on the expanding and cone type anchors made by several companies permits recovering of the rod, provided the threads have not become worn or rusted to the extent that the rod will twist out of shape.

One of the greatest uses of the nut retainer, however, is the service it renders

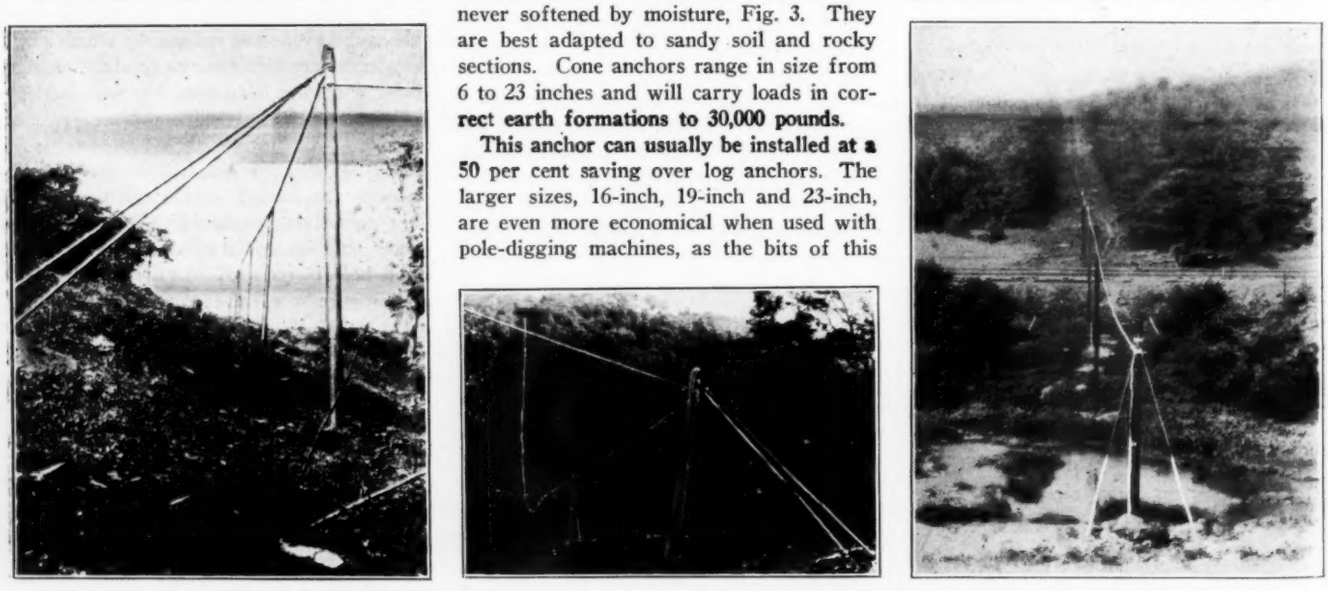


Fig. 3. Cone Anchor Installations Showing Double Guying on Corners, Ends, and Railroad Crossings.

during installation in locking the anchor on the rod so that it will not slide up or hang on roots and rough places in the hole. This little device has proved a great time-saver to telephone men.

A point to remember in the installation of the expanding and cone anchors is that the size of the hole should be as near the diameter of the anchor as possible. Supervision is very important in the installation of these anchors for their holding power is greatly dependent on the earth against which they pull.

Since the hole for the expanding and cone anchor covers a large portion of the area of their pull, it is necessary to exercise care in tamping the earth back into the hole. Carelessly-tamped earth has but little holding power in comparison with the undisturbed portion.

With the plate type anchor the size of the hole has very little to do with its holding power, since it has a greater surface bearing on solid earth than any of the other three types discussed. It can be installed in holes much larger than its width with no bad effect on its holding power. The plate anchor has been developed rapidly within the last few years until now it is one of the most widely-accepted and used types on the market.

It is strongly recommended that this anchor be installed at an angle of 45 degrees, allowing the guy strand to pull directly at right angles to the plate, as shown in Fig. 4. Otherwise the rod will cut through the earth and seek its most direct angle of pull; and this will cause the line to sag.

In most earth formations and locations, installation of the plate anchor is simple; however, skill is required to place this anchor in some of the more difficult soil formations, Fig. 5.

The plate anchor closely resembles the old "dead-man" in its pull against solid earth. The fact, however, that there is less possibility of it creeping and that it pulls against an absolutely solid wall of earth, ever devised; but the time element in its installation and the unusual skill necessary to place it properly have practically ruled it out of modern pole line construction. A conservative estimate of the patented anchors now used in comparison with the log anchor or "dead-man," probably would be in the ratio of 70 per cent patented to 30 per cent log anchors. The greatest part of this increase has taken place within the last seven or eight years.

Of the great number of patented anchors now used, the plate anchor is one of the leading types. This is probably because it offers practically the same holding power as the old "dead-man," and can be installed in less time and at less cost than any of the other types when considering the security it provides.

The most practical sizes of plate anchors now used range in size from 5-inch by 10-inch to 10-inch by 40-inch, giving holding pounds. One of the most popular size plate anchors is the 8-inch by 20-inch, giving 160 square inches of holding surface and carrying loads of 10,000 pounds in sandy formations, to 16,000 pounds in clay and 22,000 pounds in hard pan or gravel.

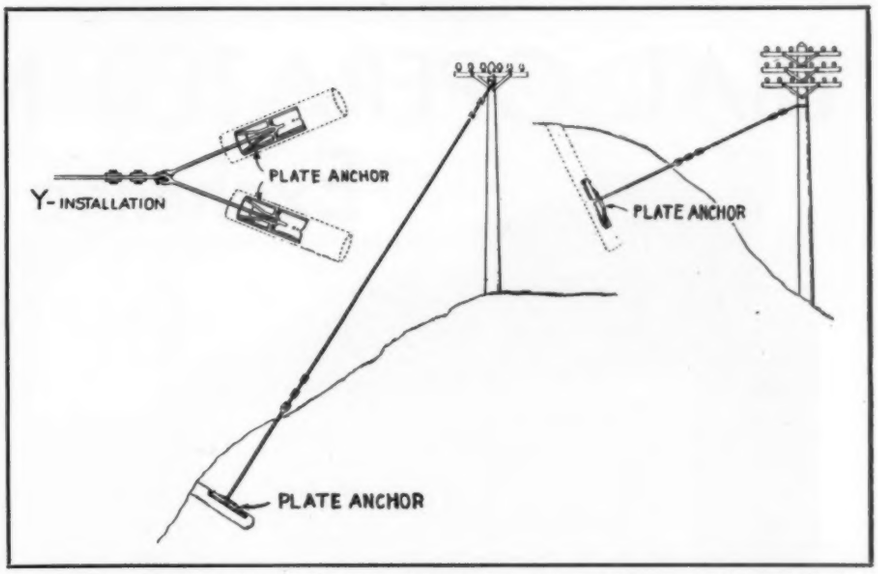


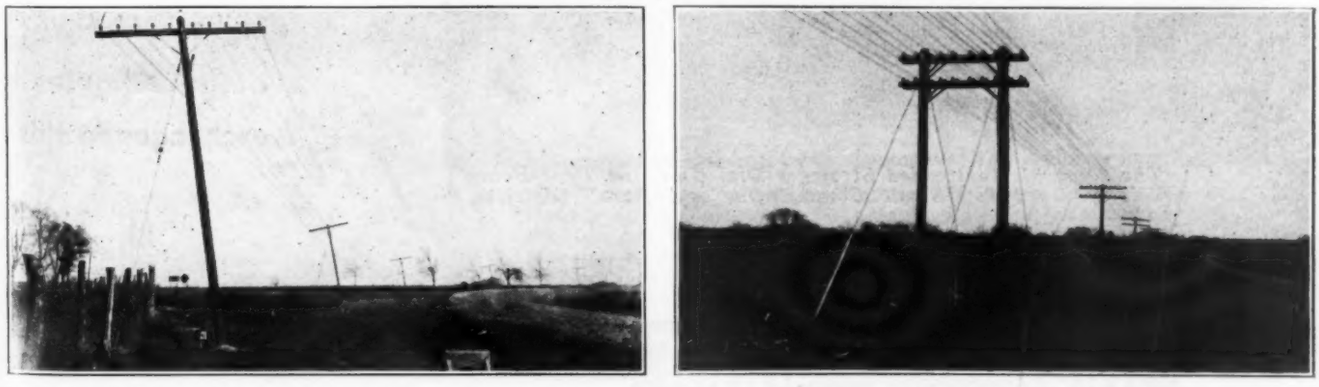
Fig. 5. Three Types of Installations of Plate Anchor. Two of Diagrams Show Method of Installing on Hillsides, and the Other, a Y-Installation, Shows Method of Adding Extra Anchor Strength to the Guy.

The method of installing the plate anchor consists in three major steps. Boring the hole, preferably at a 45-degree angle, with an ordinary earth auger; sighting and driving the rod at a direct right angle to the hole so that the point of the rod will penetrate the top of the hole; and then hanging the plate on the rod. Before guying, the rod is pulled until the anchor plate is bearing firmly against the top of the hole.

Gets Wrong Number; Shoots Down Main Trunk Lines.

A recent Associated Press dispatch from Vallejo, Calif., tells of a peculiar form of retaliation adopted by a subscriber because of a wrong number he obtained on a call.

An hour after he made the call, the dispatch states, a posse arrested the contractor on his front porch and took his rifle away. He had shot down four main trunk lines and put nine circuits out of commission.



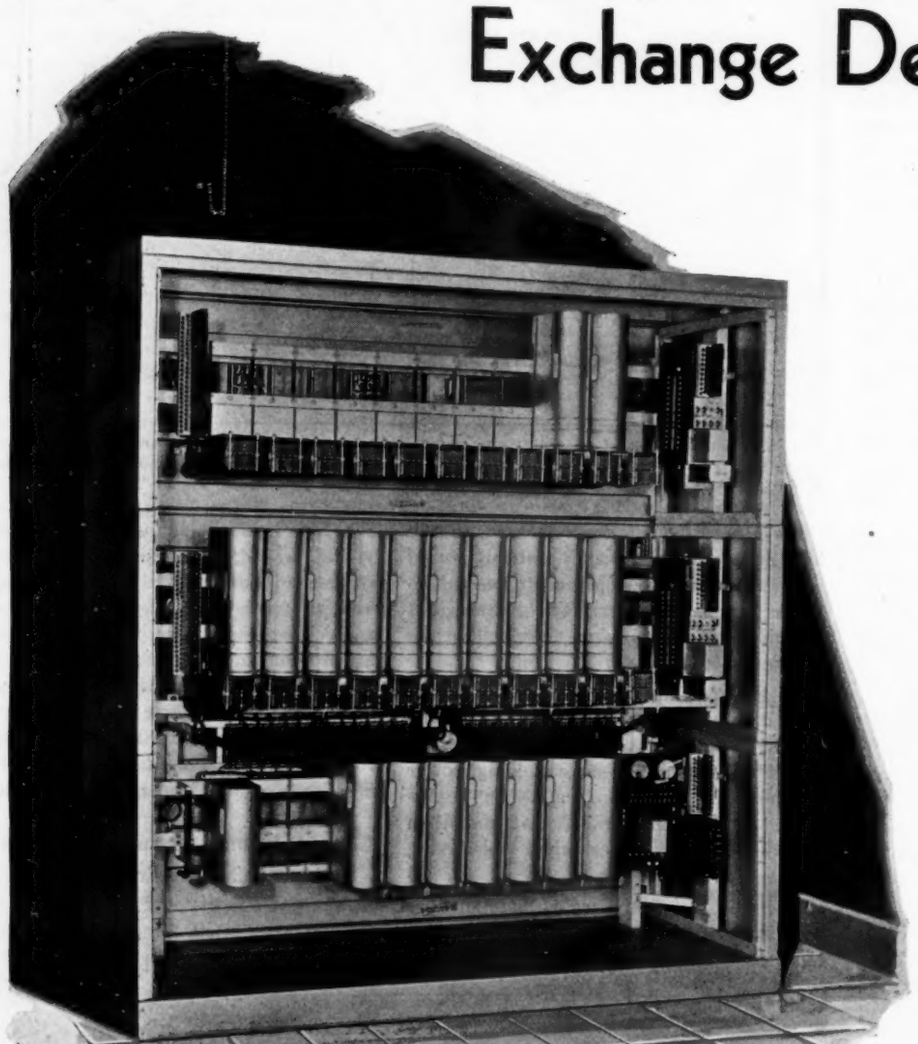
Installations with the Plate and Expanding Anchors, on a Bend, and an H-Frame Installation Used in Storm-Guying.

makes this anchor really better than most any "dead-man" could be, unless the engineer has taken unusual care and skill to install the log anchor.

There is no question that the log anchor is one of the best methods of anchoring surfaces of 50 square inches to 400 square inches. For certain types of construction, larger plates are made, but these are not used commonly in telephone line work.

Plate anchors will give security to loads ranging from 1,900 pounds to 32,000

DIAL OPERATED NETWORKS—e
Exchange Development [ec



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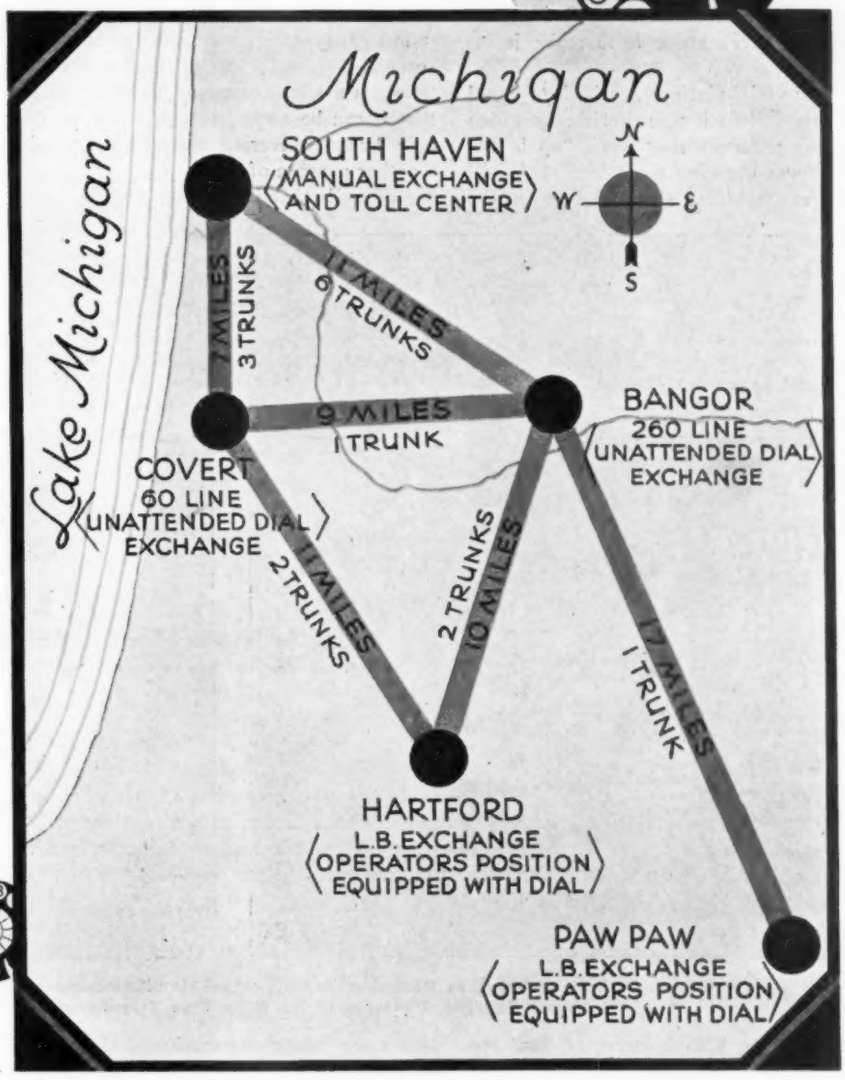

The Tri-County Telephone Company Operates Covert and Bangor on an Unattended Dial Basis, Toll and Information Service for These Two Towns Being Handled at South Haven. Hartford and Paw Paw are Magneto Exchanges, so Equipped that the Operators Can Dial Calls into Covert and Bangor.

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Manufacturers of
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Up in the Air—Working Without Spurs!

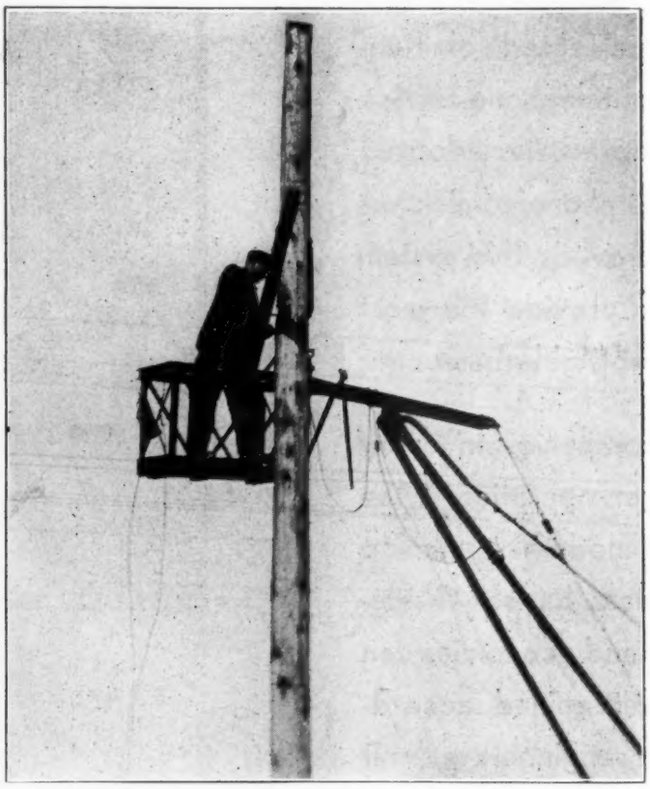
Climbing of Poles Done Away With Through Use of Aerial Platform or Basket Attached to Motor-Truck Pole Derrick—Crew Members Work "Up in Air" on Experimental Platform—Published by Courtesy of The Telephone News

By W. C. Zerman,

Plant Construction Supervisor, Eastern Area, Bell Telephone Co. of Pennsylvania

Attention in the plant department of eastern area of the Bell Telephone Co. of Pennsylvania is centered right now on a new contraption that seems to have enough unusual features about it to make it interesting.

It is an aerial platform, or basket, placed upon a motor-truck pole derrick, by which line crew members may work "up in the air" without climbing poles. Although still in the experimental stage, a few of the platforms have been constructed and are being tried out throughout the area.



Derrick Platform Is Used in Setting Poles, as Both Can be Supported Simultaneously—After Pole Is Placed and Earth Tamped in Hole, Lineman Fastens Crossarm to It. Note Tree Trimmer on Platform Support.

As the illustrations indicate, the derrick platform consists of a floor about two feet wide by four feet long, around which there is a railing 30 inches high. The whole thing is attached to the pole derrick on the back of the truck. By means of the winch it can be used to raise the lineman with his tools and materials to the desired height from which he can work on the pole in perfect safety. And when the work of the day is over and the truck is ready to return to the garage, the platform can be dismantled easily.

The complete convenience that a device of this kind offers the linemen cannot at once be realized. It is only after some of the features and uses to which the derrick platform can be put are known, that its contribution of making the lineman's job easier and less tiring can be appreciated.

The platform is constructed of steel and suspended from the end of the pole derrick. There is a slight offset to the platform so that it can be swung to either side of the pole by maneuvering the truck slightly. Another purpose of the offset is that it allows the truck to remain parallel with and close to the side of the road for all normal kinds of work. The platform is always maintained on a horizontal plane by use of a wire cable attached to the truck.

The platform can be raised or lowered to any height within the limits of the pole derrick. When the lineman climbs in with his tools and other equipment the platform is less than a foot off the ground. He gives the word and up he goes until he has reached the desired level, which may be 10, 15 or 25 feet.

It would be hard to strike much of a comparison between working in the platform and working on a pole with a strap and climbers for support. There seems to be more of a contrast. In the platform the lineman can move about easily and quickly. He does not have the weight of his tools to retard his progress, even though he has more equipment with him.

There is room on the floor of the platform for such things as bolts, lags and tools. And at one place on the railing there is a space for his electric drill, the current for which is generated by a 110-volt power plant which is built in the side of the truck.

Let us spend an imaginary day with a line crew which has one of these platforms along as part of its equipment.

Here we are, out Norwood way. The old sun is getting its eyes pretty well opened when the big Bell Telephone truck pulls up and a line crew jumps out, ready for a day's work. They are going to string an aerial cable to replace some open wire.

Watch those fellows who are assembling the pole derrick and the derrick platform. It doesn't take them very long. Now they're finished, and Joseph Marshall, lineman, is loading his tools and equipment into the platform ready to go aloft.

There he goes! Up, up, slowly, and finally the platform comes to a halt about 15 feet above the ground. The truck backs in toward the pole and stops when the platform reaches the right position. Marshall picks up his electric drill and with only normal effort bores the hole, through which he passes a bolt. This acts as the dead-end for the strand.

Then, in quick succession, the truck moves from pole to pole, while the lineman drills the holes and places bolts for the supporting strands. But that's not all he does on his journey. He places the strand in the clamps.

Before he went aloft, the strand was tied to the railing of the platform so that now all he need do is to feed it through each clamp as he comes to the poles. Note that he also passes the strand through the trees as the limbs come across the course of the proposed cable.

There! He is about to place a terminal. Watch, he is being lowered slightly. He takes the terminal from the floor of the platform and, after determining its location on the pole, fastens it in place, and has no difficulty swinging his hammer as he makes it secure.

Of course, on this pole there must be steps going up to the terminal. This means plenty of drilling, but that's no trouble. With his electric drill buzzing away, and the platform descending step by step, he is soon finished and ready to move on to the next pole.

Finally, when the cable has been strung and service has been cut over from the

As Motor Truck Moves from Pole to Pole, Lineman Quickly, Easily and Safely Trims Trees of Interfering Branches.

open wire which is replaced, the truck with its platform will return. Then the rest of the crew will take down the wire and remove the crossarms; and they can use the derrick platform if they wish.

But this won't happen for a few days, so, in the meantime, let's continue our cruise to a spot where another line crew is at work on a different kind of a job. Shift the scene to an open country section out along the Lincoln Highway, just east of Malvern. Here we find a crew that is setting poles and stringing wire.

Frank Pitt is in the platform as the truck backs over to the side of the road, pole and all. Steady there, hold it! Slowly the winch unwinds, lowering the pole while Pitt, at the top, and another linemen at the bottom, guide it into the hole.

When the pole has settled into its place, Pitt begins to line it up, and without the use of pikes. From his vantage point in the air he can quickly and surely secure the pole to a position parallel with its companions along the side of the road. Once the pole is lined up, the hole is filled in and the loose earth tamped into place.

Now the pole is ready for its "trimmings." Before the lineman went up in the platform he had prepared a crossarm with the desired number of insulators. He takes it and the braces right up with him. And so, as the last of the tamping is finished, he begins fastening the arm in place.

Before many moments have passed the truck moves down the road carrying the man, the platform and two wires along with it. Yes, the wire has been tied to the railing of the platform and all the lineman has to do is to loop it over each crossarm as he passes by in his "basket of the air."

What's he going to do when he comes to that tree? It looks as though the branches might be in the way. Can you see him? He is trimming the branches; of course, with consent of the owner of the tree. The driver stops the truck a moment so he can snip off the limbs. You hadn't even noticed the snippers as they nestled securely on the rigging of the derrick platform.

Everything has seemed to be right at the finger tips of the lineman as he went through his day's work.

PREPARATION FOR INSTALLATION AND CUT-OVER.

(*Concluded from page* 35)

because the problem of handling this type of traffic is generally a much-discussed topic in planning a cutover from magneto to common battery operation. In fact, it is one of the major questions to be decided in designing the central office equipment.

There are situations where other methods of handling local-to-rural traffic are to be preferred but, as a rule, the method suggested seems to meet all conditions in the most generally satisfactory manner.

While this paper has touched upon a number of subjects related to the cutover, and especially the preparation for this event in the life of the exchange, it is recognized that there are any number of things apt to occur and any number of situations sure to arise not contemplated by the most careful cutover expert. Ingenuity and resourcefulness will be called upon to meet some of these conditions but the satisfaction that comes from successfully

In the Platform 15 Feet Above the Ground the Lineman Easily Drills Bolt Holes in Poles with Electric Drill Operated by Power from Generator on Truck.

overcoming such obstacles and finally putting the cutover across will amply repay.

Every telephone man who reads this article will be thinking of many other points he would be checking and rechecking in anticipation of such a cutover—evidence enough that it is a broad subject and one certainly worthy of careful preparation and planning. What plans would you lay in preparation for the cutover to new central office equipment?

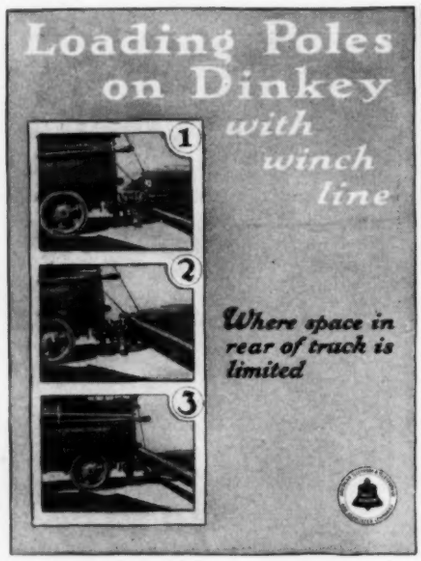
The 1931 Construction Budget of Associated Telephone Utilities.

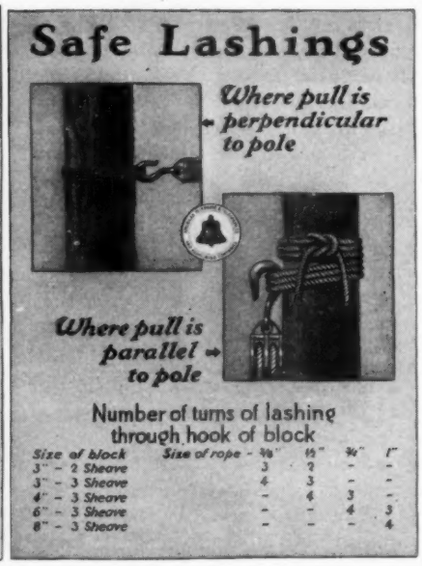
A preliminary official estimate last month placed the 1931 construction budget of Associated Telephone Utilities Co., Madison, Wis., at about $8,000,000.

More than $4,000,000 will be invested by western companies of the system in nine western states for additions, replacements, and betterments to plant and equipment during 1931, it was announced.

This is a substantial increase over the 1930 budget, it was stated. States in which the expenditures are to be made are California, Washington, Idaho, Montana, Wyoming, Nebraska, Texas, New Mexico and Kansas.

A Page of Safety Practice Suggestions




Safe Lashings
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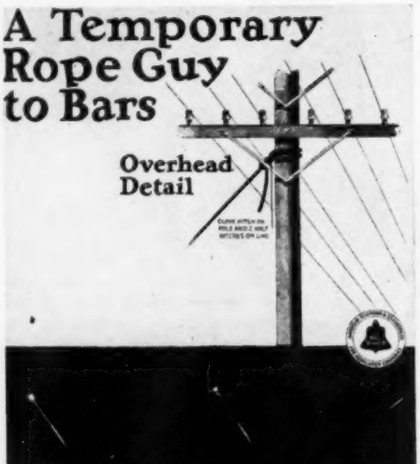

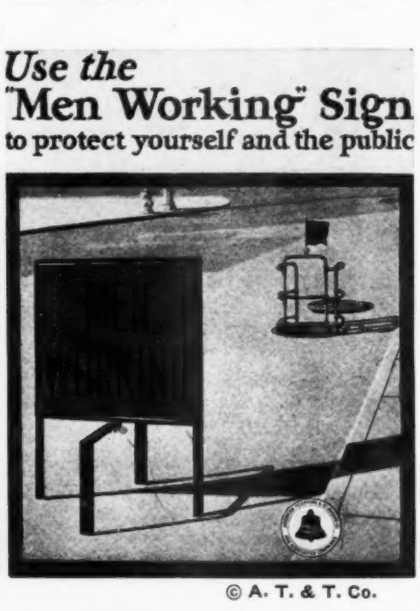

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Time for Some Constructive Thinking

Suggestion Made That Managers of Small Companies Analyze Particular Situations and Arrive at Definite Plan of Action—Selling of Metallic Service to Farmer on Slow Educational Process Possible Solution to Rate Problem

By A. R. MacKinnon,
Secretary, Kansas Telephone Association, Topeka, Kans.

This issue of TELEPHONY is a "Construction" issue and I do not know of a better time in which to do some constructive thinking. We are all planning how we can utilize our money during 1931 in order to obtain the best results with the least expenditure. And we realize that we should not spend a single dime until we have thoroughly analyzed our own particular situation and arrived at a definite plan of action which we feel will bring the desired results.

Before we can plan properly, we must decide first what results we actually need and want. We may have some peculiar personal desires, but the small company taken at large will have five important desires, especially if it has a large rural development: First, more subscribers; second, more income; third, better service; fourth, better public relations; fifth, increased toll commissions. There may be others but let us start with these five.

Our third, fourth and fifth desires are definitely tied to better transmission, and better transmission means better construction and better maintenance. Can we spend the money necessary to attain these desires during these times without the assurance of the second, more income? If our present condition of rates does not warrant the effort to improve and seek first, more subscribers when each new subscriber shows a loss on our books, it is time we did some real constructive thinking and decide on a plan so as to attain all five of our desires.

This period in telephony is really a God-send to most of us, for we are back where we started from in 1906 with commodity prices coming down to our level. Are we going to sit still and take our medicine again for another 25 years, or are we going to start selling a new type of service that will eventually raise us out of the mud and place our business on a sound foundation?

Raises in rates for our present services are out of the question, for we would be simply turning on a shower of grief and poor public relations if we tried to use that method. People are not in the mood to pay more money for the same article they have been buying for years during a time when their own products and the value of their own services are on the down grade. But they will pay more money for something new! What new idea have you?

Metallic rural service is something new to most of them and is different enough to interest and create a desire that can only be satisfied by your salesmanship in getting their names on the dotted line. There is a difference of opinion among telephone men in Kansas as to the feasibility of selling metallic rural service to the farmers.

Some say that it cannot be done, as the farmer will not pay the money for the service, and that during these times he has a hard enough time raising the money for his present bill. Maybe these people are right.

"We Should Not Spend a Single Dime," Says Secretary MacKinnon, "Until We Have Analyzed Our Situation and Arrived at a Definite Plan of Action."

Nevertheless, other companies are agreeably surprised to find that the farmer wants this service and will pay for it. One company even found that some farmers were so interested that they wanted private lines from 10 to 12 miles long. There is quite a difference between $1 or $1.50 per month and $10 or $15 per month, and yet the farmers wanted the expensive and better service. Perhaps it was not the money, but the type of service that interested them.

Too many telephone men are still thinking in the old rut. They are not looking at the value of the service to the farmer, but are considering how cheaply a service can be rendered to the farmer. The farmer wants good machinery, good cars, and modern home comforts; and most of us are gradually waking up to the fact that he wants modern telephone service.

The questions to ask the pessimist are: "If you do not sell this metallic service, how are you ever going to get onto your feet and make your company a business institution during these times? What other method have you to suggest for increasing your income without an increase in rates?"

This selling of metallic service is not a rapid process like increasing your present rates. It is a slow educational job taking from five to ten years for completion. It is like selling cars, or washing-machines, or radios or Delco lights. And the desire must be built up in the minds of your subscribers by continual repetition of the good qualities, convenience and comfort of metallic service.

"Modern" must be the word you should impress on their minds, so that eventually the grounded service will seem as something not to be desired, and the metallic service will mean telephone service to all your subscribers.

Study your rural section and select the most likely section for the sale of metallic service. Pick out 10 subscribers who can afford to pay for this modern service and concentrate your entire personal effort and your dormant selling ability on selling the idea to them.

At the same time carry on a general educational campaign among all of your rural subscribers so that they will have the seed planted in their minds by the time you have this first line sold and in operation. This will give you a chance to announce the completion of this modern service line and invite all your rural subscribers to drop over and try out the new service.

Be perfectly satisfied if during 1931 you sell only one line and your subscribers know all about it. If you can sell more than one line you will be one year ahead of schedule.

Your mental attitude during this campaign will affect your results, for you must approach this job knowing that you are rendering a real service to your subscribers and are improving your service without a raise in rates.

Five years may seem like a long time, but it may be that long before the farmer will feel as though he is on his feet again after the drop. It usually takes eight years for a farm community to recover from a rural depression, and those eight years will be full of demands for decreased utility rates to meet the farmers' income unless we sell them something new and get their minds off the old.

Ohio Underground Distribution System

Method of Block Distribution by Means of One-Inch Iron Pipes to Subscriber's Premises—Maintenance Reduced—City of Lorain, Ohio, Now Has 80 Per Cent of Wire Mileage Underground—100 Per Cent Underground Plant the Goal

By L. M. Hayes

The Lorain County Telephone Co., operating eight exchanges and approximately 10,800 telephones in Lorain and Erie county, Ohio, has completed the sixth year of its 10-year million dollar underground construction program in the city of Lorain. Telephone poles and overhead wires have been eliminated from practically every important thoroughfare in the city and underground connections have been made to 700 homes and business blocks.

In making this announcement H. E. Hageman, treasurer of the company, stated that $94,000 was spent by the company in underground construction work during 1930, boosting the total spent thus far to $600,000. Other improvements were made during the past year at a cost of $46,000, making a total cost of $140,000 for new construction work.

Eight miles of underground conduit were added during 1930, making a total of about 100 miles of conduit and practically completing all main trench lines. A total of 1,336 miles of wire were placed in these conduits, bringing the total mileage of wire underground up to 19,140.

The company is continuing its underground construction program as rapidly as feasible, with the view to eliminating all overhead construction in the city of Lorain and making the telephone system of this growing and progressive city of 48,000 population one of the best in the country. The Lorain plant is automatic in operation and serves a total of 8,700 subscribers.

The city of Lorain is located on Lake Erie and the outside plant is subjected to severe storms. A center of transportation by rail, water and air, it is believed to be destined to become a large city. Coal and iron meet in Lorain and it is contended that steel can be manufactured at a lower cost in that city than at any other point in the United States.

The company put its first wires underground in the city of Lorain in 1902. In 1909, after a severe sleet storm, it was found that even though the cost of underground construction is much higher than aerial construction, it is much cheaper in the long run. As a result a large amount of underground construction was added during the ensuing three years.

Subsequent to the beginning of the World War in 1914, Lorain experienced a rapid growth. Great difficulty was experienced in raising sufficient funds to finance the necessary additions to plant and much aerial construction was added during the ensuing year.

In 1924, however, a tornado struck Lorain, wiping out a large part of the additional aerial construction. The Ohio Public Utilities Commission, after conducting an investigation, advised an all-underground distribution system and preparations were then commenced for its construction.

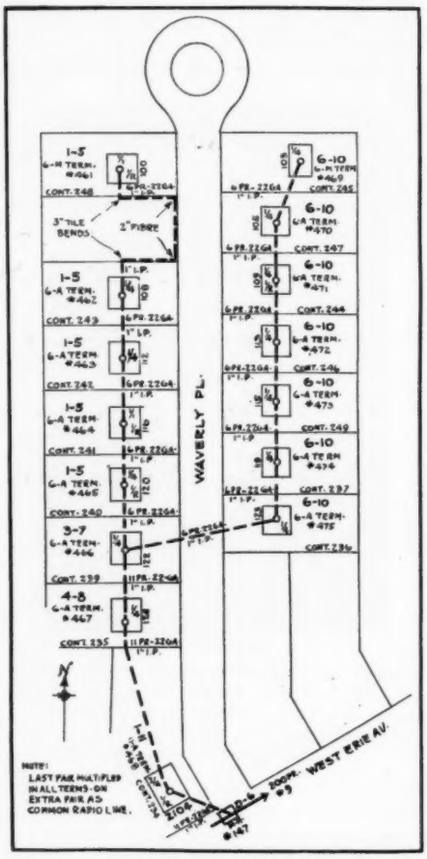


Diagram Illustrating Block Distribution in Undeground Cable System at Lorain, Ohio, by Means of One-Inch Iron Pipes from Manhole to Subscriber's Premises.

The Gustav Hirsch organization was employed to make a comprehensive study of the plant, and since then all construction has been along the lines laid down by the engineers, looking to a 100 per cent underground plant in 10 years at a cost of approximately one million dollars. The underground system as planned provides for a population of 300,000 people.

A careful checkup of the telephones with underground cable connections shows that interruptions in service in those telephones has been decreased approximately 80 per cent. Says Mr. Hageman: "We find that our people are willing to pay for this additional service because it not only improves the appearance of the streets but it also improves the telephone service."

The accompanying diagram shows the method of block distribution from a main manhole by means of one-inch iron pipe leading to the subscriber's premises. In the case of the particular block illustrated, a six-pair cable is run underground from house to house with a cable terminal in each house for service connections. The size of cable used, however, depends upon the number of residences or business houses in any one block. For instance, in a block containing 13 residences a 15-pair cable would be used and a five-pair cable terminal installed in each house.

Of the total wire mileage in the city of Lorain, 80 per cent of it is now underground. In Amherst 60 per cent is underground and in Vermilion 40 per cent is underground. Due to the installation of the underground wire system the Lorain County Telephone Co. has reduced the cost of maintenance of exchange lines year after year, even though the number of telephones has increased each year.

The Western Union Telegraph Co.'s 75th Birthday.

On Saturday, April 4, the Western Union Telegraph Co. was 75 years old. Five years before the company was formed, exactly 80 years ago last Wednesday, a group of Rochester, N. Y., men led by Hiram Sibley, Ezra Cornell and Samuel L. and Henry R. Selden, formed the New York & Mississippi Valley Printing Telegraph Co.

In the first three years, the company went $15,000 into debt, but it was still in better condition than most of the 13 other companies operating north of the Ohio River; two of these lines were sold for debt; stock of others was worth only a few cents.

In 1856 these other companies were sold to the New York & Mississippi Valley and order was brought out of confusion. On April 4, 1856, the new name of Western Union Telegraph Co. was adopted to signify the grouping of these lines. In 1861 the company built the first line to the Pacific Coast.

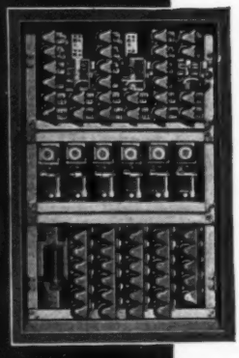
In 1866 it absorbed the American Telegraph Co. and the United States Telegraph Co. and moved from Rochester, N. Y., to 145 Broadway, New York City.

In 15 years it had grown from 550 miles of wire to 75,000 miles of wire and assumed in the telegraph business a lead that has never been relinquished.

A·T·E·A· SMALL PRIVATE DIAL TELEPHONE SYSTEMS

Standard Strowger Quality at Lowest Possible Cost

A. T. E. A. private dial exchanges combine the rapid and accurate features of inter-communication inherent in automatic working, with the lowest possible cost. Using the line finder principle of operation and standard Strowger equipment, these units offer a maximum of service with a maximum of apparatus. The cabinet units are small and compact. Simplicity of design makes installation and maintenance an easy matter, readily accomplished by anyone acquainted with electrical apparatus. Available in 10, 22, 40, 50 and 100 line units. Our prices are considered the lowest in Europe. Write for them.



Typical A. T. E. A. P-A-X Equipped for 22 Lines Providing for Three Simultaneous Conversations.

THE NEW ANTWERP TELEPHONE AND ELECTRICAL WORKS S.A.

22 RUE DU VERGER
ANTWERP BELGIUM
Export Distributors
THE AUTOMATIC ELECTRIC COMPANY, LTD.
Chicago, U.S.A.

Cables: Strowger-Antwerp. Telephone 938.00

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UNIT OF ASSOCIATED TELEPHONE AND TELEGRAPH COMPANY

When writing to The New Antwerp Telephone Co., please mention TELEPHONY.

Telephone

The boudoir telephone, by its very convenience, becomes a necessity. Each morning it helps to simplify the planning of the whole day's program. Appointments are made, invitations are issued or accepted easily and quickly. At night it is instantly available and gives a comforting consciousness of protection in case of emergency.

Many homes find it convenient to have an additional outside line for servants' use, with extension telephones in kitchen, pantry and service quarters.

Telephones in the laundry, the game room, the garage . . . save time and steps and make the business of living measurably more efficient.

In the living-room, used more than any other by all the members of the family, a telephone adds the final touch of complete comfort and convenience.

"PLEASE SEND EVERYTHING IN TIME FOR LUNCH"

Telephones throughout the house simplify household management and speed the day's routine

Wise women spend the first few minutes of every morning planning the day's program. And the boudoir telephone is an invaluable assistant. Orders from the stores, an appointment with the hair-dresser, an invitation to tea or bridge—all are completed simply, swiftly, successfully—by telephone.

And all during the day, telephone convenience eases household management for modern women. No hurrying from room to room. No tiresome trips upstairs and down. Calls are made and received instantly and easily in boudoir, nursery, sewing room, library, or kitchen. To and from friends next door, across the continent or even across the sea. That is calm and gracious living—with *enough* telephones.

The same convenience can be extended to every part of your home and to every member of your family—at moderate cost. Ask the local Business Office to assist you in planning the telephone arrangements best suited to your individual needs. They'll do it gladly.

nconvenience

erpreted in terms of better household management

ENCOURAGING the idea of *enough* telephones in the home is more than a matter of merely mentioning their convenience and comfort. "Convenience" all too often is classed as "luxury." But convenience as a part of more efficient household management, presented direct to the manager, herself, is practical selling.

For that reason, advertisements like the one on the opposite page are appearing regularly in national publications. Addressed in turn to each member of the family, they stress the advantages of adequate telephone arrangements. In speeding the business of the home . . . providing privacy for individual affairs . . . assuring comfort in the guest room . . . keeping servants contented . . . and, above all, in saving time and energy for every one, every day.

Incidental illustrations and text explain the various types of available telephone equipment—from the simple extension to the complete intercommunicating system—always making it clear that individual needs should determine the arrangements for the individual home. In each instance, the reader is referred to the local telephone company for advice and assistance.

Advertising of this character is designed to be of definite benefit to the telephone industry everywhere, whether Bell or connecting company.

Advertisement of the American Telephone and Telegraph Company

Installing Additions in Dial Exchanges

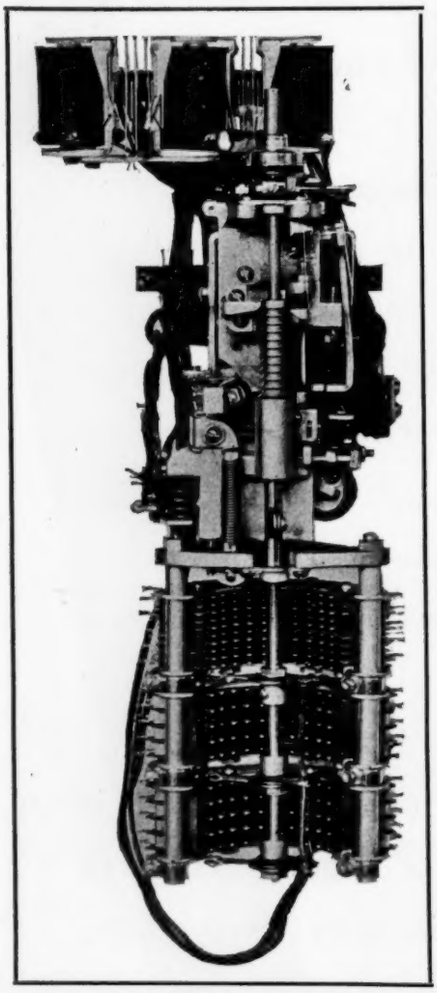
Due to Methods of Assembly in the Factory, and the Principles of Design of the Equipment, Adding to an Existing System Involves a Minimum of Labor and Interferes in No Way with Sections Already in Operation at Exchange

By E. R. Neir,

Assistant Chief Engineer, Automatic Electric Inc., Chicago

Next to its primary purpose of making money, the main function of a telephone exchange is to serve its community so well that growth will be inevitable. Except under very unusual conditions, the telephone facilities must, therefore, be so designed that additions can be easily, quickly, and economically made.

From this point of view, the flexibility of dial telephone equipment in meeting the



Early Local-Battery Type Connector.

problems of growth has a distinct appeal to the executives of telephone operating companies. Because of its unit construction it is thoroughly practical to install a switchboard with practically no investment above the actual immediate requirements. There is, therefore, a minimum investment in idle equipment—a feature which naturally pleases the telephone executive with the financial viewpoint.

This flexibility is, however, of no less importance to the equipment engineers and other technical people who are responsible for satisfactory service during the period of growth. With dial equipment, additions or changes can be made with a small amount of labor and without interfering in any way with the operation of the apparatus already installed and in service. The fact that such changes or developments cannot always be correctly estimated in advance makes this feature all the more important.

Another important feature in this connection is to provide for these inevitable refinements of design which are constantly taking place, so that each addition to an original installation can represent the very latest developments in point of quality of service, and reliability of operation.

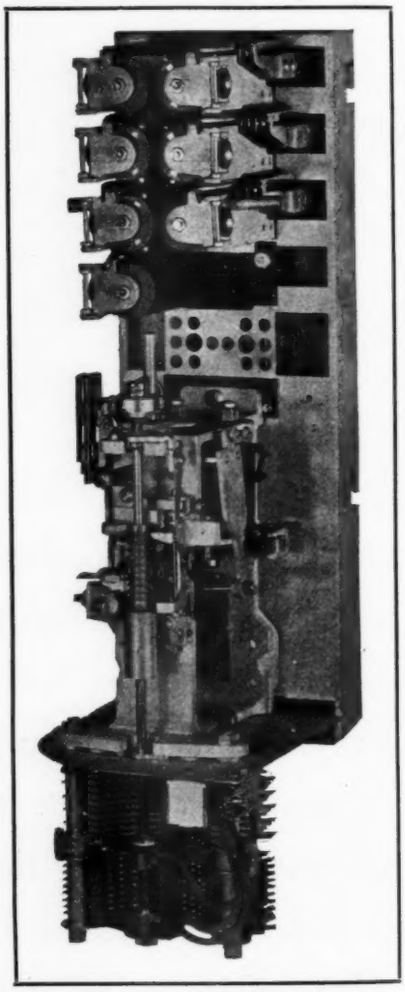
The ease with which Strowger dial switching equipment accommodates these and other requirements is largely due to the incorporation of small unit-type equipment groups and mounting frameworks. From its inception, the principles of unit-type demountable and interchangeable equipment have been inherent characteristics of Strowger design.

Strowger switch units consist of individual demountable assemblies comprising complete circuit and apparatus arrangements. The fixed electrical connections to these units are accomplished through the employment of multi-spring-contact jacks which permit the installation or removal of any unit in a simple and convenient manner. The selective switching connections between the units are established through the agency of the well-known Strowger shaft wiper mechanism.

An interesting feature of these principles of design is that while refinements have been introduced from time to time, the Strowger switch mechanism is substantially the same as originally designed. A comparison of an early type switch with that of the present-day product reveals a remarkable similarity in fundamentals and details. The switch frame for supporting the mechanism is to all intents and purposes the same; likewise the arrangements of the shaft, operating magnets, armatures, pawls, and the cylindrically-shaped banks.

In the smaller systems, during the early years of dial telephony, a unit-type Strowger switch was employed to perform all of the major functions of the interconnection of the subscribers' lines. The modern counterpart of this switch, the "connector," as it was termed, is still the most important link in a Strowger automatic switching system.

With the expansion of this early system to care for 1,000 lines, another unit-type of Strowger switch, termed the "selector," was introduced. One of these switch units was at that time associated with each subscriber's line. As the system expanded successively to capacities of 10,000 lines, 100,-



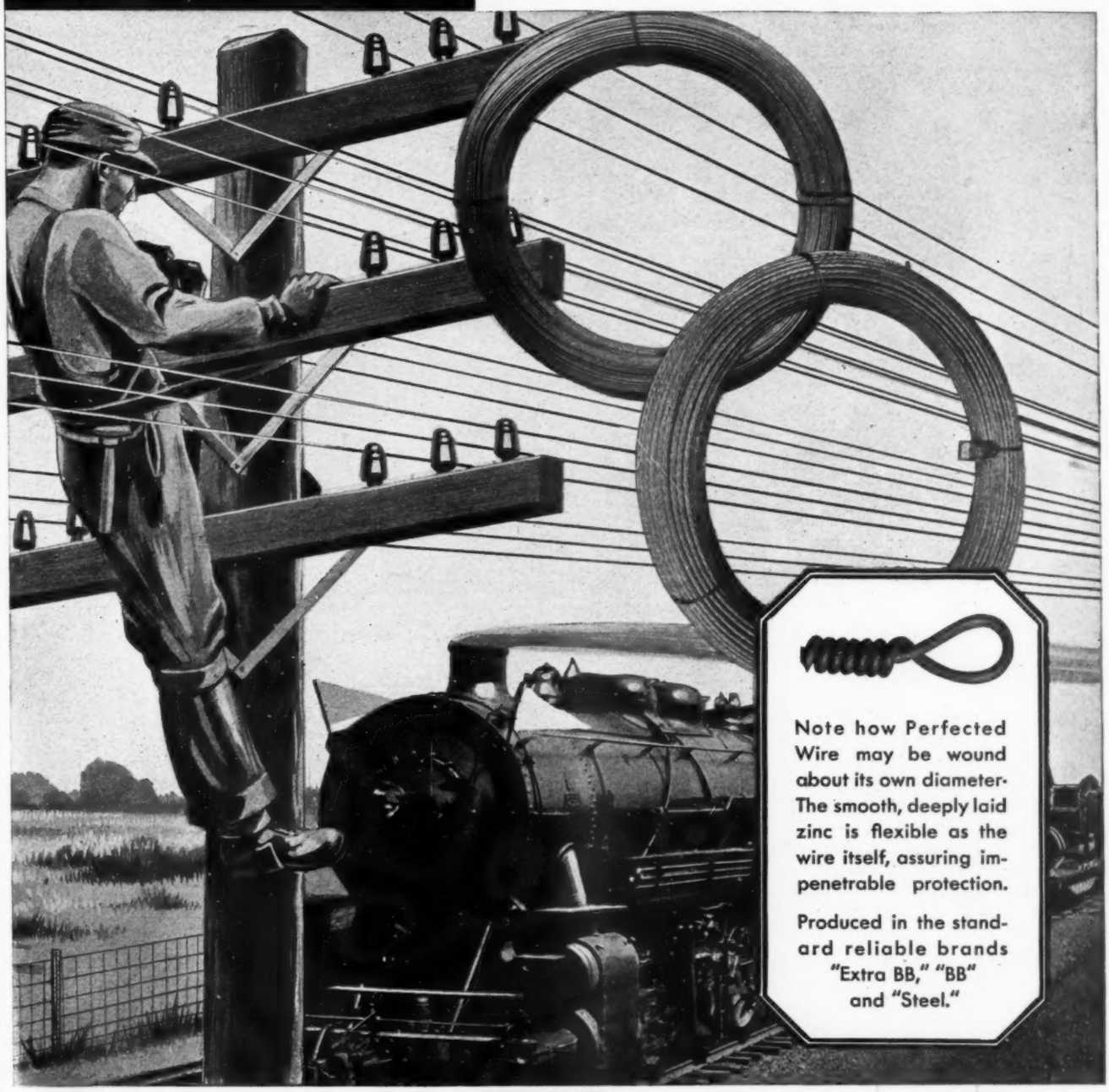
The Present-Day Connector.

000 lines, etc., other similar selectors were employed in the linking arrangement of the system.

The third important development in switching equipment units was the non-numerical individual-line equipment introduced to supplant the individual-line selector. This switch, termed the "line switch," is equipped with multi-contact jacks, like the connector and selector, thus

PERFECTED
TELEPHONE, TELEGRAPH WIRE AND STRAND

LONG before the telephone and telegraph became important factors in the pulsing life of the nation—the American Steel & Wire Company was producing wire for many purposes. So—when communication systems demanded lines for the transmission of messages, it was only natural that they turned to this Company as the most dependable source of supply. Out of this demand has come Perfected Telephone, Telegraph Wire and Strand—products that are constantly uniform, heavily galvanized to resist corrosion—and that have a conductivity and tensile strength to meet the necessary requirements.



Note how Perfected Wire may be wound about its own diameter. The smooth, deeply laid zinc is flexible as the wire itself, assuring impenetrable protection.

Produced in the standard reliable brands "Extra BB," "BB" and "Steel."

1831 — COMMEMORATING AMERICAN STEEL & WIRE COMPANY 100 YEARS of PROGRESS IN WIRE MAKING — 1931

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago — SUBSIDIARY OF UNITED STATES STEEL CORPORATION — And All Principal Cities

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco — *Export Distributors:* United States Steel Products Company, New York

When writing to American Steel & Wire, please mention TELEPHONY.

forming another demountable unit assembly. Associated with the line switch is a "master switch," also of unit-type construction.

With the introduction of Strowger equipment to multi-office exchanges, the "repeater" or inter-office trunk relay group was evolved. This is, likewise, a self-contained circuit and apparatus assembly of the unit-type.

Successively with the advancement and more general use of Strowger dial switching equipment came toll transmission switches, test and verification-train switches, coin-control relay equipment, line finders, director equipment, ringing generators, tone generators, supervisory relay-groups, etc., all of the unit-type.

Strowger switch units consist of individual demountable assemblies, each comprising a complete circuit and its apparatus. Electrical connections to these units are accomplished through multi-contact-jacks which permit the installation or removal of any unit without disturbing the other equipment.

The unit-type Strowger equipment is mounted on suitable jack-equipped shelves, and these shelves are, in turn, mounted on frameworks. Where banks are used with the switches, they are installed in sets the length of the shelves or convenient divisions of the shelves. Hence only the immediate requirements of switch units need be provided; yet the existence of the banks and their cabling make it easy to add individual switches as they are required.

The present unit-type shelves are especially adapted for easy and economical expansion, since they are equipped with terminal blocks for connecting incoming trunk cables and local bank cables. A fuse panel, to care for the fusing of the switching equipment, and the miscellaneous shelf supervisory apparatus are mounted on each shelf.

These shelves are assembled and wired in the factory, thus forming self-contained units which can be easily installed on the existing framework as required. As all wiring to the equipment is terminated on a terminal block on the shelf, the only connections required are made to these blocks, without disturbing the wiring to the switch unit. The framework for mounting the shelf units may also be designed on this same unit principle.

The following are illustrative of those features of unit design which have a particularly important bearing on ease of expansion:

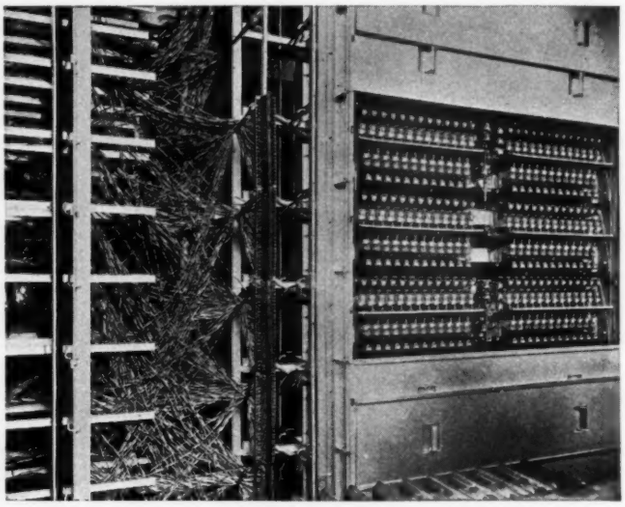
(a) The mounting of switching equipment "back-to-back," thus realizing greater space economy and the reduction of the amount of framework.

(b) The mounting of line switches, either plunger or rotary type, on horizontally-positioned, hinged shelves.

(c) The building up of sections of frameworks to any practical height, similar to the familiar sectional bookcase. This feature is especially applicable to the small-sized private or public exchange.

(d) Provisions for complete trunk and line distribution by means of a specially designed combination intermediate and main distributing frame.

(e) The elimination of all connector-terminal-to-distributing-frame cables, and line-switch-terminal-to-distributing-frame cables, by placing the line switch and connector frames at right angles and in proximity to the terminal side of the distributing frame.



View Showing Method of Jumpering Between M. D. F. and Dial Equipment.

These fundamentals in design have permitted the universal adoption of Strowger dial equipment for all types and requirements of telephone systems. Intercommunicating systems for the home and small places of business, private branch exchanges (P-A-X) for all sizes and types of business institutions, automatic switching systems for rural communities, systems of unlimited size for the metropolitan exchanges, and long distance toll-dialing systems for toll networks, are practical accomplishments.

It is thus readily apparent that the well-known Strowger unit-type principle of construction offers an excellent method for the installation of a minimum number of equipment units for any given traffic requirements with the positive assurance that future developments can be successfully met with economic efficiency.

Annual Convention of Petroleum Industry Electrical Association

The Petroleum Industry Electrical Association will hold its annual meeting at the Statler Hotel, St. Louis, Mo., April 20, 21 and 22. As it is in a flourishing condition, both financially and socially, a successful and interesting convention is being planned. The present officers are:

President, F. S. Leonard, Shell Pipe Line Corp., St. Louis; first vice-president, A. J. Balcom, Magnolia Pipe Line Co., Dallas, Texas; second vice-president, C. E. Foster, Oklahoma Pipe Line Co., Muskogee, Okla.; secretary-treasurer, H. E. Browne, Prairie Pipe Line Co., Independence, Kans.

The association comprises the superintendents of telephone and telegraph in charge of communication systems of the large oil, gas and pipe line companies in the Southwest. At the annual meetings important matters pertaining to the operation and maintenance of the communication lines are discussed, and the sessions have proved very helpful in promoting the efficiency of the service.

The membership of the association consists of oil, gas and pipe line companies having heads of communication and power systems. The corporations enrolled are: Continental Pipe Line Co., Ponca City, Okla.; Shell Pipe Line Corp., St. Louis, Mo.; Pure Oil Co., Chicago; Sinclair Pipe Line Co., Tulsa, Okla.; Humble Pipe Line Co., Houston, Texas; Oklahoma Pipe Line Co., Muskogee, Okla.; Magnolia Pipe Line Co., Lone Star Gas Co., and Pure Oil Pipe Line Co. of Texas, all of Dallas, Texas.

Empire Co. and Phillips Petroleum Co., both of Bartlesville, Okla.; Continental Construction Co., Kansas City, Mo.; United Gas Co., Texas Pipe Line Co., both of Houston, Texas; Independent Pipe Line Co., Tulsa, Okla.; Prairie Oil & Gas Co., Independence, Kans.; Pure Oil Pipe Line Co. of Oklahoma, Tulsa, Okla.; Standard Pipe Line Co., Shreveport, La.; Prairie Pipe Co., Tulsa, Okla., and Atlantic Pipe Line Co., Dallas, Texas.

Development of Telephonic Communication in Iowa Charted.

James L. Potter, member of the electrical engineering faculty of the University of Iowa, has chartered development of telephonic communication in the state, showing 67 per cent increase in toll service in the past five years. At the present, connections can be made with 85 per cent of the world's telephones through the long distance exchanges of the state.

Upon basis of the recent increase he estimates that by 1933 there will be 10,000 circuit miles of cable; 2,400,000 open-wire line and 1,250,000 miles of carrier line.

THE MODERN TREND

Tune In! Get Station P495 for Your Construction Program. Once in the Air it will always be your Favorite.

Your Maintenance Costs Will Drop, Your Profits Will Rise and Your Public Relations Will Be Better Because Unnecessary Interruptions to Service Will Be Eliminated.

The P495 Sawtooth Lightning Arrester is Self Cleaning and is a Distinct Mark of PROGRESS in the Field of Telephone Protection.

Easily Interchanged With Most All Types of Arrester Blocks
Write for Samples

Reliable Electric Company

3145 CARROLL AVE. CHICAGO, ILLINOIS

When writing to Reliable Electric Co., please mention TELEPHONY.

Illinois Construction Program Encouraging

Expenditures for Additions and Replacements Will Amount to More Than 30 Million Dollars—Budget Compares Favorably With Average for Past Five Years—Larger Margins of Plant Mean Improved Operation and Better Service

Illinois, with slightly more than 6 per cent of the population and about 9 per cent of the telephones of the country, plans on spending over $30,000,000 for additions, betterments and replacements during the year 1931, according to information obtained from the companies by the Illinois Telephone Association. This sum represents the activities of some 474 telephone companies operating a total of over 1,800,000 stations, with a plant investment of about $336,000,000.

The reasons behind such an ambitious program of improvement are sound since they are based on the fact that there is a general feeling that business has reached the bottom of the depression and is now on the upgrade. Furthermore, Illinois is in a fortunate position as a result of the great diversity of its business enterprises which does much to keep the prosperity of the state on an even level.

In spite of the fact that the fine weather of last year enabled many companies to bring their plants into rather exceptional condition, most companies are going ahead with construction work at a rate that compares favorably with the average for the past five years.

Analyzing the proposed expenditures, it will be found that every working day in Illinois will see over $100,000 spent on construction work. This means that the greater portion of the thousands of telephone workers will be kept busy the year around.

The Illinois Telephone Association, through its plant, traffic and commercial representatives, is cooperating with Illinois companies to aid them in carrying out uniformity in planning, construction, operation and maintenance. This is necessary on the part of each company if the telephone industry and the public are to benefit from the administration of our business to the fullest practicable extent.

It would appear from a survey just completed that Illinois companies are planning to make an intensive campaign for new business in order to maintain their leadership in business. On a basis of a net gain of 3½ per cent in total number of stations, nearly 65,000 telephones will be the increase for Illinois in 1931. Such an expansion in business will necessitate much outside plant construction, consisting in the placing of local cable and plant to provide additional facilities to serve this new business in growing areas.

It is encouraging to learn that some of the smaller companies are planning to take advantage of the plentiful supply of labor and the low cost of materials, especially copper wire, to replace their grounded circuits with the more satisfactory metallic circuit system. In other cases, inter-city circuits (trunk and toll circuits) whose iron wire has outlived its usefulness is being replaced with copper wire. This activity makes for improved transmission and service. Since this change is being made gradually, it is only a matter of time until repetitions in telephone conversations will be a matter of ancient history.

Among the larger projects are the construction of seven or eight exchange buildings and one general garage. Numerous additions to existing exchange buildings are contemplated. Because active building operations are necessary to general business prosperity, it will be seen that the telephone industry in Illinois is contributing to the momentum of the revival of good business conditions.

A few of the specific construction projects under way in Illinois are outlined as follows:

The 1931 budget of the Illinois Commercial Telephone Co., with headquarters in Murphysboro, is approximately $500,000, according to information received from C. R. Brown, Madison, Wis., vice-president in charge of operations.

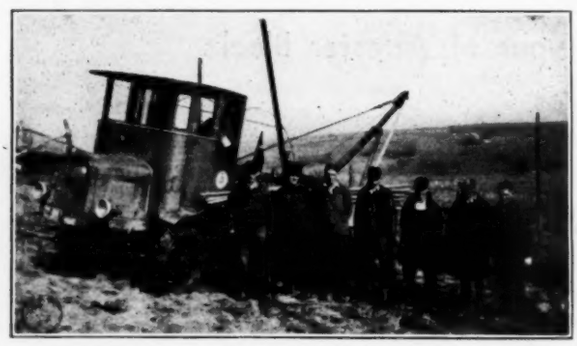
The company's efforts this year, as in the past two years, will be toward getting the outside plant in good physical condition. The budget, accordingly, is principally made up of a great number of rather small plant projects. A few of the major ones, however, will consist of new central office equipment at Tuscola, Ill., a new toll lead between Chester and Pinckneyville, and rehabilitation of the Olney-Albion, Lincoln-Bloomington, and DuQuoin-Pinckneyville toll leads.

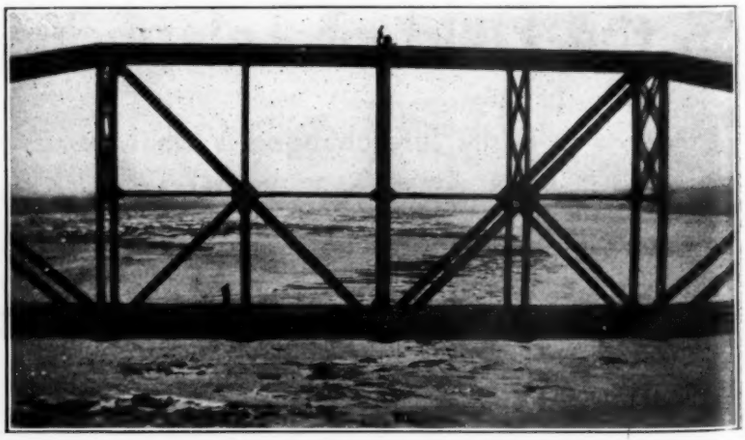
The 1931 construction plans of the Illinois Southeastern Telephone Co., with general offices in Mattoon, Ill., provide for an expenditure of approximately $123,100, according to E. C. Purcell, vice-president.

At Martinsville the company plans to rebuild the outside plant of the Martinsville Telephone Co. at a cost of $9,600.

In Shelbyville the Illinois Southeastern Telephone Co. (controlled by the Illinois Southeastern) will construct additional cable and block work at an expenditure of $7,000. In Mattoon toll lines will be reconstructed and additional circuits strung at a cost of about $12,000. At Charleston a new exchange building is to be erected at an expenditure of $30,000.

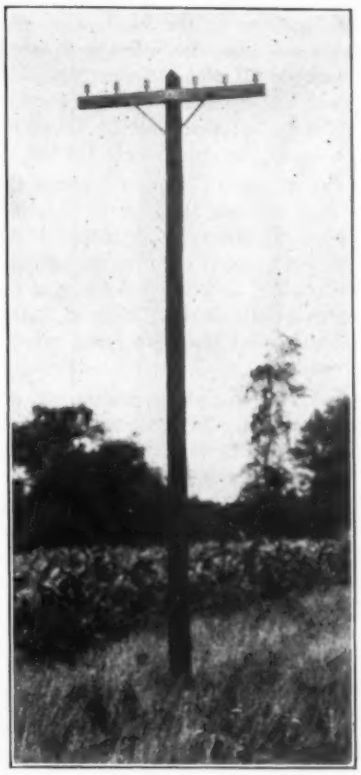
The Illinois Consolidated Telephone Co. of Taylorville (controlled by the Illinois Southeastern) will reconstruct its Raymond city plant during the ensuing year, increasing its cable and terminal facilities at a cost of $5,000. At Pana the company will construct a new exchange building at a cost of approximately $25,000 and rebuild the outside city plant with additional telephone cable and terminal facilities at a cost of approximately $20,000.





Construction Crew of the Northwestern Bell Telephone Co. All Ready for Setting the First Pole on the Ewart–Ottumwa Line in Iowa—Northwestern Bell Men Cutting in Transpositions on Bridge Fixtures. One Man Is Faintly Outlined on the Top of the Bridge.

NEW POLE STANDARDS

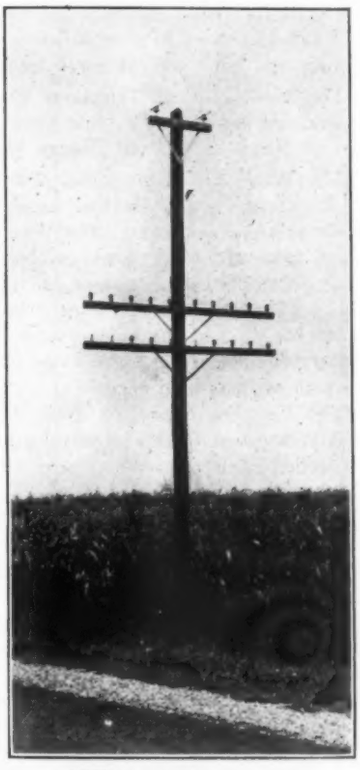


The question of the proper fiber stress to be used in calculating the strength or load capacity of wood poles has at last been definitely settled, and the following values adopted for the National Safety Code:

Creosoted Southern Pine	7400 lbs.
Chestnut	6000 lbs.
Western Red Cedar	5600 lbs.
Northern White Cedar	3600 lbs.

The American Standards Associated Committee, in conjunction with representatives from the U. S. Forestry Department, Utility Associations, and Pole producers, after an extensive study of many tests and all available data, has solved this problem for the Utility Engineer.

Long and rigid service tests in different sections have already proven the superior durability and resistance of Southern Pine to decay and other destructive agents, when treated, full length, by the pressure method with high grade coal tar creosote oil, and when due consideration is given to the fact that this high breaking strength of Pine is maintained practically uniform, thru this preservation. for more than thirty years, it is readily apparent why Utility Engineers are adopting this type pole as the safest and most economical.



In the work of supplying the pole needs of the Telephone Industry, the Brown Wood Preserving Co. is advantageously situated by reason of its extensive Pine timber holdings, assuring a future supply of poles at uniform cost, and the operation of two modern treating plants, at Brownville, Ala. and Louisville, Ky. This set up enables Brown to furnish Creosoted Dense Southern Pine poles at an economical cost, uniform in quality, and make prompt deliveries.

Try BROWN on your next pole requirement.

BROWN WOOD PRESERVING COMPANY
4th & K Streets, Louisville, Kentucky
Long Distance Telephone—Magnolia 2407

BROWN

CREOSOTED YELLOW PINE PRODUCTS

300,000 Acres One of the largest

Individual Holdings in America

In addition to the local plant improvements outlined, the Illinois Southeastern Telephone Co. plans to construct additional copper toll circuits in the territory served by the Illinois Consolidated Telephone Co. at a cost of approximately $14,500.

The Western Illinois Telephone Co., according to Area Manager C. E. Holsclaw, expects to complete its major 1931 construction projects early in the spring. The Aledo plant is being rebuilt at a cost of approximately $40,000, while at Boston the toll and rural lines are being rebuilt and rerouted.

F. C. Woods, vice-president and general manager of the Intra State Telephone Co., Galesburg, Ill., reports that his company will spend nearly $50,000 in pole line, underground and cable construction.

The Mid-Continent Telephone Co. will complete the rebuilding of its Byron and Stillman Valley exchanges, according to R. D. Elliott, division manager for the Mid-West States Utilities Co., which controls the Mid-Continent company.

The Farmers New Era Telephone Co. will replace considerable aerial cable, split several rural leads and make general repairs to its outside plant at New Hebron. From its Richmond exchange the company will extend service to several new summer resorts and split several rural leads.

The New Milford Telephone Co. will extend and improve its outside plant facilities at New Milford and Cherry Valley.

The Winnebago County Telephone Co., of Rockford, plans to improve its plants at Rockton and Winnebago. The Winnebago plant, local and rural, is undergoing complete rehabilitation preparatory to the occupancy of the company's new building about May 1 and the cutover to common battery equipment. An American Electric switchboard has been ordered.

The Farmers New Era, New Milford and Winnebago County companies are all controlled by the Mid-West States Utilities Co.

The Port Byron Telephone Co., according to B. M. Skelton, general manager, will expend $3,000 during the ensuing year in constructing a new line of poles from Rapids City to Hampton, a distance of four miles, moving one and one-half miles of poles on a new section of route 80, completing some cable work in town and converting to metallic two of the company's longest lines.

A general plant overhauling is contemplated in the construction plans of the Smiley Bros. Telephone Exchange, O'Fallon, Ill., according to word from E. H. Smiley, for this year. This work will include the stringing of 2,500 feet of cable to replace present aerial wire.

The Pike County Telephone Co., Pittsfield, Ill., of which Ed D. Glandon is secretary and manager, reports that its 1931 construction program will consist, largely, in replacing old wire with new, erecting a new exchange building at Hardin and miscellaneous plant renewals. The building will probably cost $7,000 and the renewals about $10,000.

About $5,000 will be expended by the Jerseyville Telephone Co., Jerseyville, Ill., in pole replacements, new cable and switchboard changes.

The following companies report plans improving their outside plant: Suburban Electric Utilities Co., Dunlap, Joe Finley, manager; Good Hope Farmers Switchboard Co, Sciota, Ill., G. C. James, secretary-treasurer; Greenup Telephone Co., Greenup, Hunter Waterford, manager; Antioch Telephone Co., Antioch, C. F. Richards, secretary; and Mendon Telephone Co., Mendon, A. H. Gay, manager.

The Illinois construction budget of the Southwestern Bell Telephone Co., according to D. Coombs, connecting company agent, estimates the total 1931 expenditures at $317,000. This includes $59,000 for outside plant work; $75,000 for land, building and central office equipment and $183,000 for routine expenditures.

The Illinois Bell Telephone Co.'s construction program contemplates gross expenditures of $29,450,000, according to a communication from E. R. Cogswell, general commercial manager. The program provides facilities for an estimated station gain of 40,000, as well as for improvements and betterments to plant, where necessary.

Ample allowance is also made for a toll construction program to meet the year's service requirements. The budget provides for the erection of five or six new central office buildings in various exchanges, the addition of units to existing central offices, a new tandem board, etc.

South Dakota's 1931 Program

Companies to Spend One Million Dollars in Repairing Damage Caused by Sleet Storm, in Moving and Rebuilding Rural Telephone Lines on Account of Highway Road Building Project

By Thos. Phalen,
Secretary-Treasurer, South Dakota Telephone Association

The worst sleet storm in the history of South Dakota occurred November 19 and 20 of last year. This storm covered the northeastern part of the state completely and also reached portions of the south central part of South Dakota. Telephone companies affected by the storm restored service in a temporary way in an amazingly short time, considering the extent of the storm area.

"Telephone Companies of South Dakota Are Ready to Provide Facilities for Increased Use of the Telephone," States Secretary Phalen.

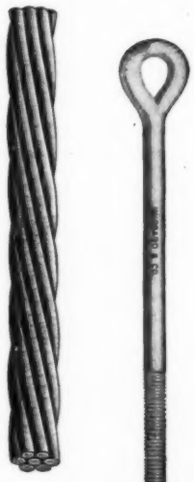
It was estimated that 15,000 poles were demolished by that storm. Of this amount approximately 7,000 were toll poles and the remainder, rural poles. Because of the extent of the properties of the Dakota Central Telephone Co. and Central West Public Service Co. those companies suffered the greatest outside plant losses. Telephone companies located in the area covered by that sleet storm plan to rehabilitate the plant damaged during the spring and early summer of this year.

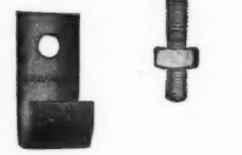
The state highway commission is planning on an extensive highway building program during the coming summer which, no doubt, will necessitate moving many miles of rural and toll pole lines located on the highways to be improved. This will result, in some cases, in rebuilding the pole lines located on these highways.

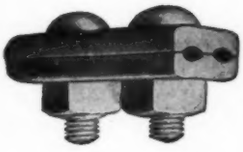
From information compiled the indications are that the South Dakota telephone companies will spend approximately $1,000,000 in replacing storm damage, moving, re-routing and rebuilding toll and rural pole lines on account of highway improvement before the year of 1932.

South Dakota telephone companies went through an extensive construction period during the years 1929 and 1930, which included rebuilding several exchanges and installing modern equipment and rebuilding rural lines. The toll companies in the state rebuilt many of the toll pole lines and several miles of toll wire and repeater equipment were added during that period.

Plans other than repairing storm damage and moves on account of highway improvement will depend largely on whether or not business conditions improve. However, the Dakota Central Telephone Co.'s







Suttle Service Applied to Construction Materials

ANNUALLY—at the time of each Independent Telephone Convention—telephone men take stock of their accomplishments and progress of the past year. It is fitting, therefore, that we—as suppliers for the telephone industry—review our set-up on construction supplies for the independent telephone industry.

The key to the unusual service offered by Suttle is to be found in the organization that handles orders for these materials.

Our personnel is composed of men skilled in the knowledge of telephone supplies, schooled in the theories of modern telephone practice—men who know how to handle your orders intelligently and are willing to extend every effort to provide an unusual supply service.

Add to this our exceptional warehousing and shipping facilities, our strategic location in the geographical center of the telephone industry, our strict adherence to the rule that only standard quality supplies are offered—and you have the factors that contribute to the satisfaction of Suttle customers.

The success of these factors has built for this company a host of friends among the telephone companies.

We invite you to investigate our service—both in the emergency of unexpected requirements or during the routine of regular business. Send an order to Suttle and see for yourself the intelligent and prompt treatment it receives. May we suggest that you—

Order from Suttle

Suttle Equipment Co.

FACTORY AND MAIN OFFICE

Lawrenceville, Illinois

When writing to Suttle Equipment Co., please mention TELEPHONY.

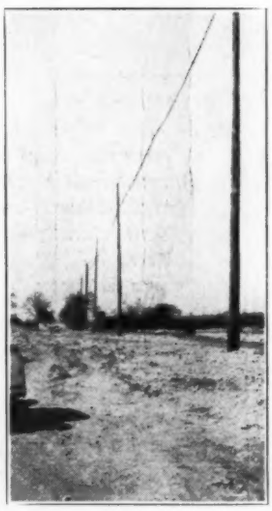
budget for this year provides for cable extensions and replacements and additional equipment in their larger exchanges, also the rebuilding of exchanges and rural plants at several of their small and medium-sized exchanges. They will build approximately 50 miles of toll pole line and about 500 miles of toll copper wire.

The Northwestern Bell Telephone Co.'s program for this year includes additions to switchboards, more telephones for new subscribers, new buildings, more local and long distance equipment and other facilities.

The Central West Public Service Co., Omaha, Neb., plans on the complete rehabilitation and the reconstruction of its South Dakota properties during a five-year period. At the present time the company is engaged in rebuilding its Lennox exchange and plans to rebuild five other exchanges later in the year.

The Groton-Ferney Mutual Telephone Co., Groton, and several other companies, including farm line companies located in the sleet storm area, will be kept busy replacing property damaged by the storm. The Missouri Valley Telephone Co., Mound City, will rebuild its Herreid exchange. The city-owned plant at Brookings will string 2,000 additional feet of cable. The Peoples Telephone & Telegraph Co., of Hot Springs, will replace 35 miles of toll pole line. The Citizens Cooperative Telephone Co. at Plankinton may install a new switchboard. The Armour Telephone Co., of Armour, will add about 2,500 feet of underground cable.

South Dakota telephone companies are ready to provide adequate facilities to meet the increased use of telephone service and to assist as far as possible in the nation-wide effort to provide employment.



Pole-Setting Machine in Readiness for Setting a Telephone Pole.—Pole-Setting Machine in Action—Work of Setting Pole Completed. Views Show Raising of Toll Pole Line of Michigan Bell Telephone Co. to Permit Highway Rebuilding and Widening. The Cable Was Raised So That Steam Shovels Could Work Under It.

Prominent Men to Appear on Program of Ohio Convention.

The Ohio Independent Telephone Association, whose annual convention is to be held on April 15, 16 and 17, has completed its arrangements for a full and entertaining program to be presented at that time. The convention is to be held in Columbus at the Deshler-Wallick Hotel.

The program to be presented at the convention follows:

WEDNESDAY, APRIL 15, 2 P. M.

Address of welcome by Jas. J. Thomas, mayor of Columbus. Response by Frank Binkley, Bellefontaine.

Address by Governor George A. White.

Annual report of the president of the association by J. Warren Safford, Troy.

Annual report of the secretary-treasurer by Frank L. McKinney, Columbus.

Appointment of committees: Resolutions, auditing, election tellers, miscellaneous.

General discussions will follow the appointment of the various committees. Nominations for five directors will then be submitted before the association after which the session will adjourn.

THURSDAY, APRIL 16, 10:00 A. M.

Timely comments describing the outlook for the telephone industry as it appears at the present time made by executives and officials of well-known companies. They will also recount plans of their own companies for 1931 and discuss other matters of interest. Some of these telephone men are:

C. R. Brown, operating vice-president, Associated Telephone Utilities Co., Madison, Wis.

Fred I. Shoemaker, president, Standard Public Service Co., Columbus.

Frank A. Knapp, president, Northern Ohio Telephone Co. and former president, Ohio Independent Telephone Association, Bellevue.

J. G. Crane, vice-president, Telephone Bond & Share Co., Kansas City, Mo.

C. L. Jones, general manager, Athens Home Telephone Co. and former president, Ohio Independent Telephone Association.

Curtis M. Shetler, president, Utilities Service Co., Canton.

An address entitled "The Ohio Bell Program During 1931" will be presented by Randolph Eide, president, Ohio Bell Telephone Co., Cleveland.

"The Independent Telephone Pioneers" will be given by J. K. Johnston, secretary-treasurer, Independent Pioneer Telephone Association of the United States, Indianapolis, Ind.

"The Service Connection Charge One Means of Postponing Higher Rates in Growing Communities" is to be presented by Herman Hageman, treasurer, Lorain Telephone Co., Lorain.

Following reports of the auditing and resolutions committees, there will be a round table discussion of association matters, after which prominent telephone visitors from other states will be introduced. After the election of five directors, the session will be adjourned.

THURSDAY AFTERNOON, APRIL 16.

The eighth annual traffic conference will be held. The speakers on this program will be announced at a later date.

The organization meeting of the board of directors, with the newly-elected members taking part, will be held at 5 o'clock p. m.

THURSDAY, APRIL 16, 6:00 P. M.

Banquet and dance. The association announces that a fine program of entertainment has been arranged for this event.

FRIDAY, APRIL 17, 10:00 A. M.

"Our Campaign for New Business During 1931" will be given by A. J. Albert, general manager, Standard Public Service Co., Columbus.

"How an All-Year Campaign Assists the Northern Ohio Telephone Co. to Obtain and Retain Business," by W. C. Henry, general manager, Northern Ohio Telephone Co., Bellevue.

"Some Aspects of Transoceanic Telephony," by L. E. Whittemore, American Telephone & Telegraph Co., New York City.

"Radio Program Service as a Revenue Producer," by Geo. B. Quatman, vice-president, Utilities Service Co., Lima.

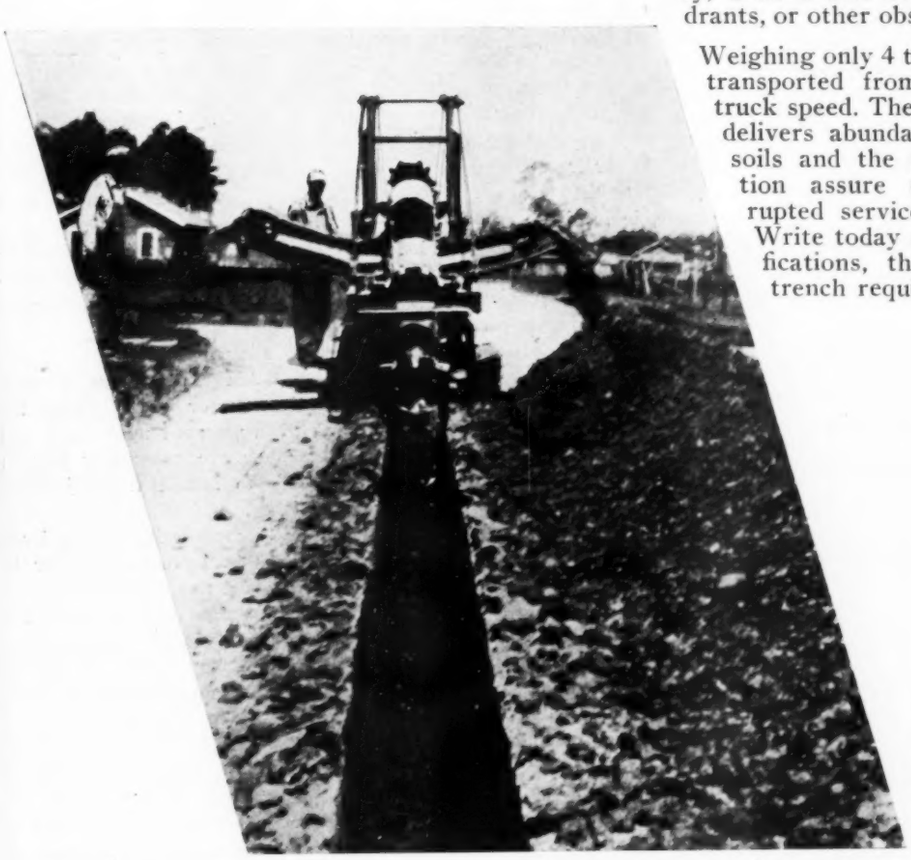
"Automatic Exchanges for Smaller Places," by R. F. Burfeind, sales engineer, Automatic Electric Inc., Chicago, Ill.

VERSATILITY TO MEET THE EVER-CHANGING CONDITIONS

CONSIDER the trenching job — tough soils, narrow working spaces, surface and underground obstacles, widely scattered locations, these are but a few of the many adverse conditions attendant to the digging of conduit trench.

Compact, mobile, powerful, sturdy and fast the Baby Digger is especially designed to deliver maximum results on conduit trench digging—and besides it is usable on better than 95% of your jobs.

Only 58" wide, the Baby Digger slips easily by, around and between trees, poles, hydrants, or other obstructions.



Weighing only 4 tons it is easily and quickly transported from location to location at truck speed. The husky four-cylinder motor delivers abundant power for the toughest soils and the precision, quality, construction assure steady, consistent, uninterrupted service for many miles of trench. Write today for full information and specifications, then check these against your trench requirements.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

20100 ST. CLAIR AVE. CLEVELAND, OHIO, U. S. A.

The CLEVELAND BABY DIGGER

When writing to The Cleveland Trencher Company, please mention TELEPHONY.

More Smaller Anchors Recommended

Anchoring at Frequent Intervals Reduces Strain on Lead, and Damage in Case of Sleet Storms—Few Locations Call for Heavy Anchors—Suggestion to Telephone Companies for the Correct Types and Sizes of Anchors to Stock

By Lester Pierce Boll,
Distribution Engineer, W. N. Matthews Corp., St. Louis, Mo.

When Edison's and Bell's epochal inventions were offered to the world, they created the greatest development and manufacturing era ever known. To bring the electric light and telephone into popular use necessitated the manufacture of supplementary materials and equipment at a price enabling the utility to place its service within the reach of all.

The development work naturally was a slow, tedious process; first, ideas were borrowed from telegraph construction and later modified and improved to fit each case. For the sake of economy the overhead system of distribution is used chiefly until large concentrations of load are created, or civic conditions require the placing of these circuits underground.

It is the overhead portion of the distribution system with which we are particularly concerned, in that the subject deals chiefly with overhead lines. Overhead lines must be constructed so as to safely withstand normal strains imposed upon them by the natural weight and tension of the conductors, and also to withstand excessive strains that occur during heavy winds and sleet storms. One of the most important parts of this supporting structure for the conductors is the anchor.

Use of Anchors.

Most operators appreciate this, and anchor the line at corners or where the line makes a bend. This method in ordinary city or suburban types of construction is generally sufficient, because there are enough anchored corners or bends to hold the line should a break occur; but in the rural sections and on long straight lines, the more general use of anchors should be made.

In case of severe storms and sleet, should the wire break the greater the number of anchors used, the smaller the portion of the line that would be broken. Only a few locations generally call for an anchor that has large holding power. Anchoring at frequent intervals not only reduces the strain but also it reduces the damage if the line should break or become laden with sleet.

Anchoring only at points of heavy strain is undoubtedly a left-over from the days of the log anchors or "dead-man." This anchor is very expensive to install, but when properly installed it has a holding power equivalent to the tensile strength of the rod used. Naturally, just as few of these installations as were absolutely necessary were made, due to their heavy cost.

Since the advent of the so-called patent type of anchor, fewer "dead-men" are being used, but still a large number of these installations are being made. Where labor is cheap and material relatively high, there is some excuse for them; but as the reverse is true almost everywhere, the only excuse for an installation of this kind is that it satisfies a Doubting Thomas of the construction force.

Holding Power of Patent Anchors.

Hundreds of tests of the various types and makes of anchors have been made by the operating companies and the manufacturers. These tests show that the patented anchors on the market today are capable of safely handling the strains the manufacturers recommend for them.

Anchors are available in sizes that are sufficient for all purposes. These anchors are made in four main types—screw, expanding, plate and cone. The choice of type rests chiefly upon the liking of the man and upon the kinds of earth encountered.

The screw type anchor comes the closest of any of the types to being the universal type, but its particular field is in sandy or clay soils or marshy lakes. While this type of anchor can be installed in the hard clays, disintegrated rock, etc., one of the other types may be slightly easier to install, unless the thin type helix screw anchor is used.

In marshy ground or shallow lakes of water, the screw type of anchor is the only type that can be installed, because all of the other types require the boring of a hole; and this, of course, is impossible in marshy ground.

Stock of Anchors.

Every anchoring location is really an individual problem in itself, due to either a difference in the strain to be held or in the holding power of the ground. To have a different anchor in the storeroom for each one of these conditions is not practicable nor economical. It is, therefore, necessary to choose two or three different sizes, and perhaps more than one type, which will meet the average requirements. Then for the special cases, which are generally exceptional strains or ground in which it is difficult to make installations, use two or more of the stock sizes.

This not only simplifies the stocking of anchors but also of guy wire and clamps, to say nothing of the distribution of the strain to more than one location, and the safety resulting from having more than one anchor.

In any discussion of anchors, the location of the anchor with respect to the pole should be given serious consideration. The farther away from the pole that the anchor is located, the smaller will be the angle between the guy and ground and, therefore, the lower the strain. When the anchor is located at a distance from the pole equal to the height of the pole, the angle is 45 degrees.

This angle is generally considered as the best from all considerations, but one usually finds that in the majority of installations the angle between the guy wire and the ground is greater than 45 degrees. This places a greater burden upon the anchor and guys than is necessary. Installations such as these should only be made when local conditions or obstructions will not permit the 45-degree location.

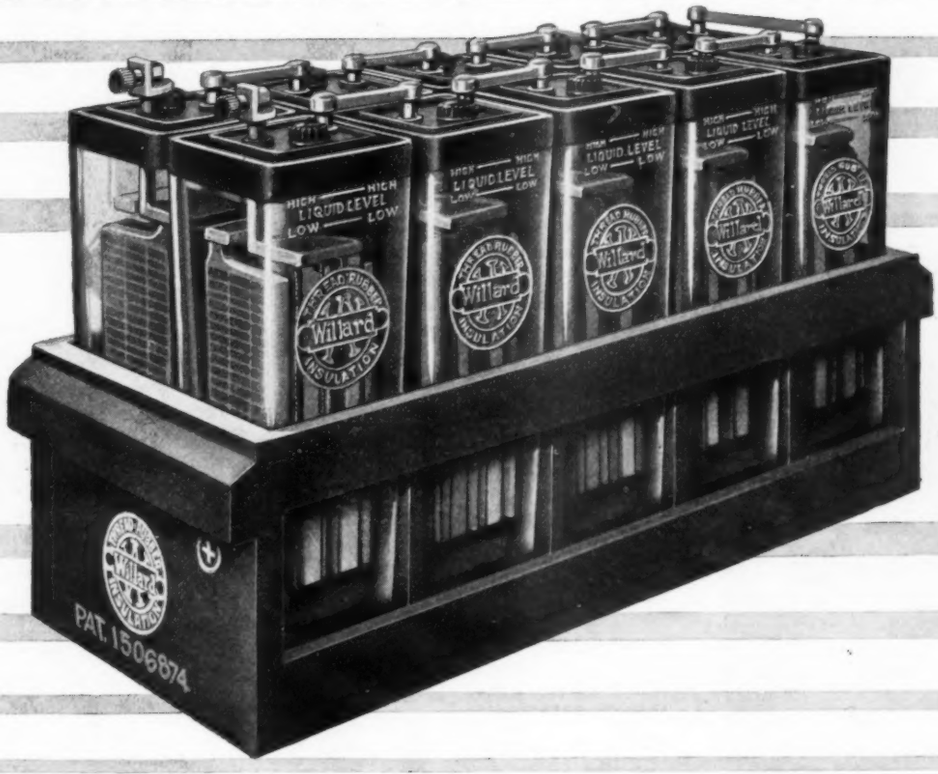
Practically all patented types of anchors have holding power in average soils equivalent to or greater than the strain that the rods used upon them will withstand. They are reasonably low in price and easy to install, which justifies their general use.

It is highly recommended that a large number of anchors be used in order to greater stabilize the line; and, that rather than install one large anchor, the strain be broken up and distributed between two or more anchors, in order to provide additional safety and assurance of continuous service to the customer.

American Desert Oasis Gets Outside Telephone Connection.

Twenty-nine Palms, one of the most picturesque oases in the California desert, now boasts of a telephone, a link to the new transcontinental line some six miles away. Twenty-nine Palms is located about halfway across the desert, along the trail between Whitewater and Amboy. Its sheltering palms and cool springs have provided a haven for many a weary and thirsty wanderer in years gone by.

It has the setting of an oasis of Araby or Africa, rather than that of a typically Southwestern desert. In recent times it has become a mecca for tourists and now boasts of a hotel and a cluster of buildings; but up to a few weeks ago it lacked telephone connection. The building of the new line across the desert, however, has now made such connection possible.



Type CTRS 5-10—for Higher Voltage Installations

ENGINEERING CO-OPERATION: TO MEET YOUR TELEPHONE PROBLEM

Today Willard offers to the communication field a line of telephone batteries developed through years of painstaking effort in one of the most progressive storage battery laboratories in the world. Designed to meet the needs of either floating or cycling service, these batteries are ruggedly and compactly built—to perform dependably in a wide variety of power applications.

In order that its telephone batteries may meet the requirements of every installation with the highest efficiency and economy, Willard places at your disposal the services of its trained engineering staff. Willard engineers, with broad experience in battery installation problems of every description, are ready at all times to consider *your* requirements intelligently and to co-operate with you in meeting them successfully.

Use Willard Storage Battery Engineering Service in Your Communication Work

Willard STORAGE BATTERIES

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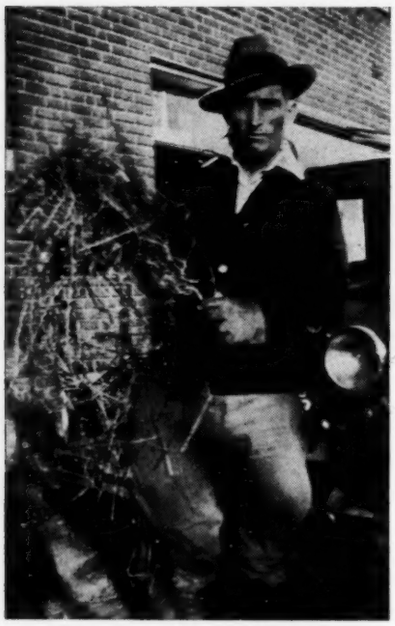
When writing to Willard Storage Battery Co., please mention TELEPHONY.

Here and There in Telephone Work

Poor Splices Mean Inferior Service So Company Removes Them.

A chain is as strong as its weakest link, but a telephone conversation is weakened by the combined effect of all imperfect



A Tangle of High Joints—Paul Norris, a United Lineman, Holding 570 Improper Splices That Were Removed From the Four Months' Time.

splices or joints in the line, says a writer in The Voice, the monthly magazine of employes of the United companies, Abilene, Kansas.

Sleeve splices in new wire will remain good indefinitely, but in splicing old wire after a storm break it is necessary to carefully clean the wire ends with emery cloth or "sand strip" before reliable joints can be made.

While copper toll line wires are readily cleaned and prepared for sleeving, it is by no means as easy to clean iron wire; and when the galvanizing is gone, few men have the patience to clean iron wire for tinned steel or tinned copper sleeves applied over cleaned iron wire ends which have no galvanizing.

In the latter case it is preferable to make twisted splices and to "neck-bridge" them with No. 18 bare tinned copper and solder. The neck-bridging method can also be used on existing twisted splices which have become rusty, and it is not necessary to cut out line joints which are good mechanically.

The United companies rarely acquire telephone properties in which the rural lines do not have to be cleared of high resistance joints before proper service can be given. To merely cut out the old twisted splices and cut in new ones without soldering is futile, for such lines would show higher in resistance within two years if not at once.

If the wire has not lost its galvanizing, the twisted joints are still good, even though not soldered. If the galvanizing is gone, permanent joints cannot be made without sleeves or solder. The wire may be cleaned thoroughly, but twisted joints in ungalvanized wire will not remain good for two years.

The neck-bridging method consists of sand stripping the twisted center portion of the splice "shoe shine" fashion, to provide four bright "humps" in two-wire joints and six bright humps in three-wire joints. The No. 18 bare copper strap wire is then twisted about these bright humps in reverse direction to the twist of the wires and soldered. This provides four soldered bridges across the joint, any one of which suffices to make the joint perfect.

Since heat is applied only to the center portion of the splice, "neck-bridging" can be done with the wire under strain and without the use of blocks or interruption of service.

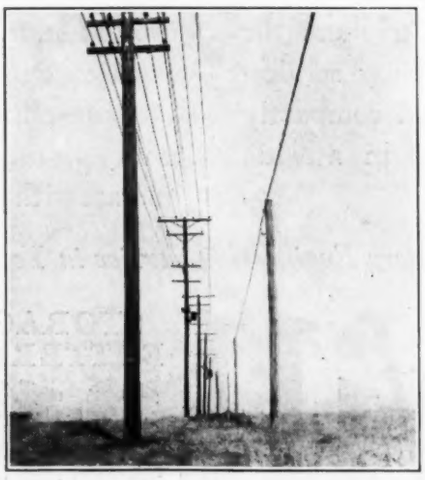
To untie a rural lead for slack pulling without taking advantage of the opportunity to drop the wire and remove bad joints, is something United employes rarely do, for they know the great value of wholesale preventive maintenance as against the expense of hunting for individual cases of trouble.

"I Wonder Why" of an Observing, Traveling Telephone Engineer.

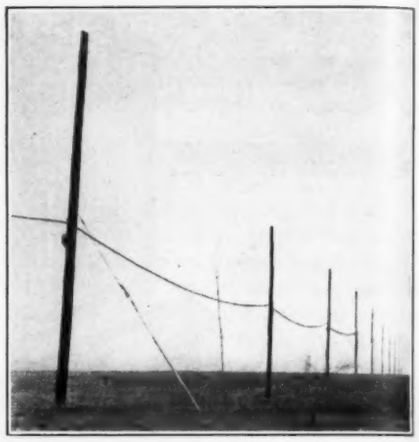
By Ray Blain.

I wonder why telephone and electric companies do not take advantage of joint construction more often than they do?

In the average town or city where joint construction is not used, the electric company will generally have high poles on one side of the alley and the telephone company a line of shorter ones on the other side. There is generally ample clearance on the electric company's poles for the telephone cables, terminals and drop wires. Even should it be necessary to place higher and larger poles in order to take advantage of joint construction, it would still prove an advantage, for it is much cheaper to maintain one pole line than two.



Two Pole Leads Where One Would Suffice.



Cable Lead Built to Provide Joint Construction When Electric Wires Are Placed Later.

With the old style of mounting transformers low, it was sometimes quite difficult to get proper cable clearance on a transformer pole. At the present time, most electric companies mount their transformers up near the crossarms and this difficulty is not encountered.

Many cities are now taking advantage of joint construction on all rebuilding and new work. The smaller towns seem to be slow in taking advantage of this money-saving system.

Even in underground work, joint construction will generally prove an advantage. The conduit run can be common with separate ducts and manholes. Manholes can be built double with a partition between. One excavation can be made for both, and one drain can do double duty.

Some of the larger companies have engineers who devote all their time to the studies of joint construction. It is believed that some of the smaller companies can benefit by similar studies.

Working for Company's Benefit? Youth, Interest and Experience.

I read your magazine each week and am always anxious to receive the next or following number. As I have been sick for the last month, but expect to return to work in the near future, I thought I would write a few words about my telephone ideas.

PORTER HKP

PORTABLE HAND OPERATED

CUTTING TOOLS

The Shear Cutter

This is the most recent adaptation of the Porter lever and toggle joint principle and is the first Porter tool having jaws operating on the shear principle with the cutting edges passing each other in the cutting operation.

It is made in three sizes, 14 in., 24 in. and 36 in. The 36 in. has a capacity of 5-8 in. soft wire rope or flat bars 1 1-2 in. x 9-32 in.

In cutting wire rope the Shear Cutter severs every strand and leaves no uncut or ragged edges. On flat stock the cut is clean and the edge of material is not unduly twisted or distorted. The Shear Cutter is rapidly gaining recognition as a valuable time saver in many industries as well as an emergency tool for airports. It has the cutting capacity of a bench or power tool plus portability. It is used extensively in wire rope plants and has been found to meet a long felt want in elevator and hoist installation work where wire cable is used. Telephone and power companies are using this tool with great satisfaction on guy wire and it promises to be one of the most popular models ever brought out by this company.

The Porter line of portable cutting tools includes Bolt Clippers, Chain Cutters, Nut Splitters, Shear Cutters, Wire Cutters, etc. in a number of sizes and models. Write for folder illustrating and describing the Porter line.

Sold by leading jobbers.

H. K. PORTER INC.

11 Ashland Street

EVERETT MASS.

FANSTEEL CHARGERS 2.15

Remember this number

..*It saves you money!*

As any battery engineer knows, if your batteries are kept constantly at an average of 2.15 volts per cell, they will require less water, deposit less sediment, perform better, last longer. And every extra month of service you can get out of a battery—is just that much more profit for you!

The simplest and most economical way to keep small central office or PBX batteries in healthy condition is to "trickle" charge them with Fansteel Chargers which deliver a small, continuous charge, just enough to maintain always the proper voltage for batteries and circuits.

Fansteel Chargers, replacing "charge and discharge" methods, have *often lowered power costs as much as 50%*. They eliminate the need for duplicate batteries and save in maintenance costs.

Investigate! Write today for literature and prices.

FANSTEEL PRODUCTS COMPANY, Inc.

North Chicago, Ill.

Quiet!

All hum is kept out of talking circuits by means of a newly developed indestructible electrolytic condenser, an integral part of Fansteel Charger Type CBI-F, at left, especially recommended for PBX and small common battery boards.

In my travels I have met many different classes of men engaged in telephone work, both good and bad, and it seems to me that one-half or more care only for quitting time and pay-day. They do not seem to care whether they are working for the company's benefit or not.

Some people are much afraid of doing something for which they are not paid. That is the attitude of class and caste which leads to decay. It represents the foreign system of servants and not the American system of partners in business. The person who adopts it may possibly hold his job, but his chance of promotion has gone and the chance of demotion and discharge has come—it is the most certain road to unemployment.

Those who do only what they are paid for will never be paid very much. No business can be a success in which that system is used. Whenever employes begin that practice, they are bound for part-time work and possibly none. There is no need for that kind of employe.

Success most generally comes to people who are not considering the narrow question of what they are paid. The question of what they can do to help leads to the promotion of the individual and the profit of the business, as well as the good of the nation.

It may be that you think you are getting ahead if you are holding a steady job. You figure that you can go on year after year with that steady little income, so you are letting the future take care of itself. If that is your position, if that is the view you are taking of your prospect, you are in a critical situation. You are one of those men who cannot realize that no one can stand still. You are either going ahead or you are going backward.

You are not going ahead unless you are learning more about your business or the work you are doing every day, and making use of the knowledge you get. You begin to slip back the very day you stop learning. Other men are busy getting better posted and will forge ahead of you.

I believe quite a bit in what former Secretary of Labor Davis said regarding advancement made in disproving the false philosophy that men are through at 50 or even before. In his annual report to Congress, he said: "More and more it is becoming the experience of our most enlightened employers that men of the age of 40 or 50 years or over often are better qualified by experience, ability and settled habits to render more valuable service than those of a younger age."

Youth has a gorgeous time in this world, although usually unconscious of it. Despite that fact, the world is not meant for youth any more than it is meant for middle-aged and aged. Humanity is after happiness; and happiness is not brought about by turning middle-aged men and women out of jobs just because it is a fad to serve youth.

This is a day of efficiency. The efficient worker succeeds and the inefficient worker is lost in the discard. Now I think a man should strive to learn all he can about his line of business. Many of these half-way folks "get by," but they never *get very far.*

There is always a premium in business for the man who does his work painstakingly, with completeness and finality. He is the man who will be trusted with more and more responsibility up to the limit of his capacity. The man who informs himself adequately about his firm, its methods, its policies and its product; who does his work so well that no one need follow him up to patch the ragged edges, is on the safest, surest and shortest road to achievement.

I know there are lots of good, reliable conscientious men in the telephone business and I believe they are getting better each year. I hope it will continue in the future.

It seems to me that most telephone companies are standardizing quite a lot of their line construction and I think that is one of the best things they can do.

JAMES G. MEREDITH,
Port Clinton, Ohio. Line Foreman.

It's a Good Trick if You Do It—Here's How!

Is it a hard job to open the door of a safe?

"Not if you have the right combination," says The Telephone Bulletin, magazine of the employes of the Southern New England Telephone Co.

Is it a hard job to get into a cable car from a pole having a guard arm over the strand?

Many of the fellows have said that it is quite a trick. But you can do it easily and safely if you have the right combination of motions.

When the accompanying pictures were taken, Instructor Barry of Southern New England company's construction headquarters was demonstrating the approved method. He is not a tall man, but he seems to slip into the car with little effort and with no chance for a strain or a fall.

After you have tried it this way a few times, you will probably agree that it can be done quickly, easily and safely—the guard arm won't bother you at all. You will feel as sure of yourself as a man starting to open a safe when he knows he has the right combination for doing it.

Fig. 1. Ascend the Pole and Place Safety Strap Around Pole Below the Cable. Pull Up Cable Car and Place It on the Strand with Open Side Away from Body. Slide Car Up to Guard Arm. Place Right Hand on Guard Arm. Test Footing of Right Foot and Put Left Foot Through Car as Shown. Then Unstrap Safety with Right Hand—Replace Right Hand on Guard Arm or Pole and Fasten End of Safety to Left D Ring with Left Hand.

Fig. 3. Reach Down with Right Hand and Grasp Climber Just Above Ankle.

Fig. 4. Raise Right Foot with Hand and Carry It Over Seat and Straighten Leg. This Prevents Straining or Spurring Which Might Take Place if the Leg Were Swung Through Without Being Lifted by Hand.

Fig. 2. Here the Safety Strap Has Just Been Removed from Pole. Now Place Right Hand on Guard Arm Near End. Slide Over to Left in Seat, Taking Right Foot from Pole. Release Left Hand. Hook Left Arm Around Top of Car and Grasp the Top of Car and Strand with the Left Hand as Shown in Fig. 3.

Fig. 5. Grasp Guard Arm with Right Hand, Turn Body to Sitting Position.

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How to Take Peg Counts —Their Use

Regular and Supplementary Peg Counts, Local and Toll, Are Important in Enabling a Company to Place Business on Paying Basis—Operators' Part in Taking Peg Counts—Address at Annual Traffic Session of Ohio Association

By E. W. Lormor,

Toll Traffic Supervisor, Ohio Bell Telephone Co., Columbus, Ohio

Every business which is managed properly must have sufficient data on the various details of its operation to reflect accurately at all times the quantity it is producing, the cost of its production, how much it is selling, and its selling costs. Of necessity, the amount of data required and the form it will take depend on the needs of the particular business.

In our industry, the one thing we have to sell is telephone service. This service takes the form of individual calls—local and toll. It is our responsibility to conduct our business in such a manner that our customers will be able to command our service at any time they desire, and that when our product is delivered to them they will be pleased with it. That, of course, means fast, accurate, and satisfying service.

Unlike most industries, we have absolutely no control over how many or how few orders we will receive. We must be so set up that we are in a position at all times to take care properly of all of our customers. To be in such a position, we must estimate as accurately as possible, the number of orders we are going to receive each day and just when we are going to receive them.

To know this and to be able to forecast accurately future traffic not only for tomorrow, for next week, and for next month, but also for next year and even for future years in connection with engineering data, we must have reliable records which show our past and present performances. Since our unit of production is the individual call, these records must be in terms of calls.

It is only in this way that we will be able to schedule properly and economically our operating forces and have our operators on the switchboard ready for duty when we need them and in sufficient numbers to handle the traffic.

The only way we can tell how many calls we handle is to count them. As far as toll is concerned, that is fairly easy; it is a simple count of the toll tickets. In some few local offices this counting is done automatically, but in most local exchanges it means that the operator handling the calls must count each one as it goes through her hands.

Fortunately, we have found from experience that the volume of telephone calls, both local and toll, follows definite trends. This is true on an hour-to-hour basis and it is also true from day-to-day and month-to-month. We all know from experience that the busiest period in any telephone exchange is usually from 9:30 a. m. to 11 a. m. This uniformity in trend is the underlying principle of peg counts.

Our experience has also taught us that it is necessary to make a detailed count of the number of calls we handle only at certain fairly infrequent intervals, and that we can be reasonably certain of our traffic between these counting periods.

LESSON OF EXPERIENCE.

It all amounts to this: Whatever your hands find to do, that do with all the might that is in you. That is the lesson of all experience.

Face every task with a determination to conquer its difficulties, and never to let them conquer you.

No task is too small to be done well. For the man who is worthy, who is fit to perform the deeds of the world, even the greatest, sooner or later the opportunity to do them will come. He can abide his time, can rest—"safe in himself as in a fate."—Col. George W. Goethals.

To go into more detail regarding the taking of peg counts, let us consider local and toll separately.

The local peg counts are primarily a record of the number of calls handled in an office. Local peg counts are of two kinds—regular and supplementary. The regular count is taken monthly in most offices, and is an hourly count of originating and incoming traffic for two days. The supplementary count is taken at least twice a year and is a more detailed analysis of certain portions of the originating and incoming traffic for two days.

It is from the supplementary peg counts that certain ratios are calculated for use in converting the results of the regular peg count into usable form. The method of arriving at these ratios and their importance and use will be considered a little later.

The toll peg count is also a record of the number of calls handled in an office. As in local, it is of two kinds—regular and supplementary. The regular count is taken monthly in most offices and is a daily count of the outward tickets for ten days. The supplementary count is usually four times a year. It is a detailed hourly analysis of traffic handled in the office for three days.

From this peg count certain ratios are developed, as in local, from which the results of the regular peg counts will be converted into usable form.

I have just mentioned the frequency with which these local and toll regular and supplementary counts will usually be taken. It has been determined that the fluctuation and change in traffic in small offices is considerably less than in larger offices. For that reason in offices having a combined local and toll operating force of less than six opertaors in the busiest hour, it is considered satisfactory to take the regular local and toll peg count four times a year, in January, April, July and October.

The April count may also be omitted in these offices if the January traffic is representative of both winter and spring conditions. Likewise, the frequency of the supplementary counts may be lessened also, taking them only once a year if local conditions seem to so warrant.

The important thing to remember regarding the frequency of all of these peg counts in the smaller offices is to be sure that they are taken often enough to provide an accurate picture of the trend of the traffic, but not to take them any oftener than is necessary. To do so places an unnecessary burden on the operating people. Personal experience with each office will tell the management how often they are required.

The regular or monthly local peg count should be taken on two normal busy days as soon after the first of the month as possible and still conform with the following specifications: One of the days should be a Monday or a Friday; neither of the days should be the first day of the month nor a Saturday, Sunday, legal holiday, nor the day immediately preceding or following a legal holiday. The restrictions as to days to select are set forth to insure as far as possible the selection of days that will be representative of normal conditions.

It has also been found desirable to have a practice count taken a day or so in advance of the regular counts. In this way the operators will acquire the habit of counting. Needless to say accuracy in counting is of primary importance, and should be stressed at all times.

Ordinarily, peg count meters are placed on each position on which to register the calls. In most local offices—that is, those having only two or three classes of service with the calls of the different classes grouped on different parts of the board—

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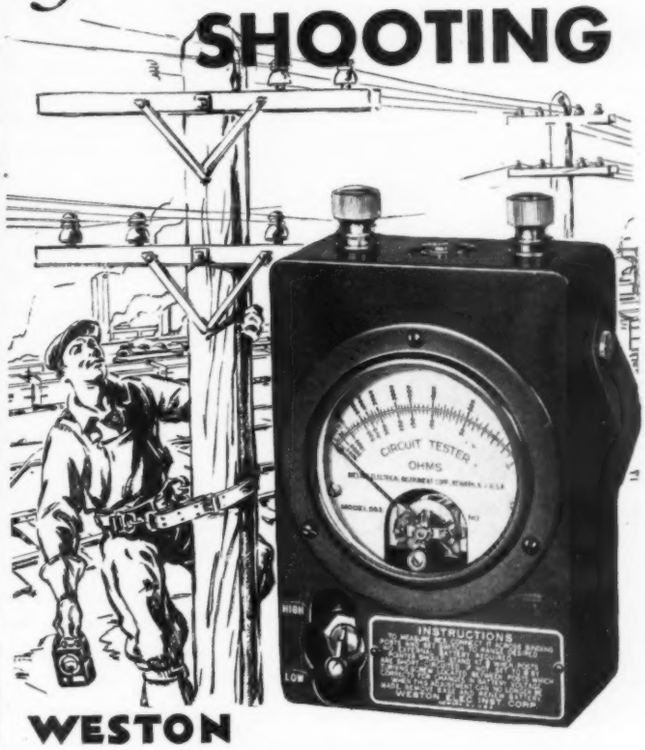

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the count will be taken by classes of service. Each operator handling more than one class of service will have enough peg-count registers or meters on her position to enable her to peg each call handled on the proper register. In some cases it will be found that the use of tally slips are preferable to meters.

Each call is to be counted while the operator is receiving the order from the person calling. One call will be counted for (1) answering a line signal on which a person calling requests a connection or communicates with the operator for any reason, (2) completing or attempting to complete an order received in response to a cord signal for connection to another number, (3) completing or attempting to complete a call on which the connection was previously made to a supervisor, information operator, etc.

Incoming calls over ringdown trunks that terminate on the local board will be counted separately. If the toll operators secure their local numbers over a call circuit to the local board, the number of these incoming call circuit calls handled by the local operator will be counted separately.

Forms should be provided for entering the results of the peg count. When meters or registers are used to count the traffic, they should be read every hour on the hour and the readings entered by positions on the form. Each preceding hour's reading will be subtracted from the last hour to give the number of calls handled during that hour.

It is important that the subtraction be made as soon as possible after the readings have been entered, since unexpected fluctuations in the number of calls recorded for any hour may be an indication of register failure or operator carelessness, which if allowed to continue would render the count inaccurate. In those offices which are small enough and where there are only a few different classes of service, it will be possible to count each class separately on the regular peg count, and the taking of supplementary peg counts will be unnecessary.

After the counts have been completed, the detailed records will be forwarded to whoever is responsible for working them up.

The regular toll peg count, as it is now set up, is simply a count of the number of toll calls handled in the office on each of ten days. This count will be taken on ten consecutive business days excluding Saturdays as soon after the first of the month as possible. If a holiday occurs during the span of these ten days, the calls for the holiday will be omitted and that month's record based on nine days.

Since every toll office maintains a daily count of calls and messages for computing its per cent completed performance, the regular toll peg count does not really mean any extra work in the office.

Inasmuch as the regular toll count is so simple, it would follow necessarily that the supplementary count would be all important. There is no use to deny the fact that it is quite a job to take it. However, it is of such importance and so much depends on its accuracy that every effort must be expended to see that it is taken properly.

These counts will be taken on three consecutive normal business days as soon after the first working day of the month as possible. As in local, one of the three days should be a Monday or a Friday, no one should be the first day of the month, a Saturday, a Sunday, legal holiday nor the day immediately preceding or following a legal holiday. It is important that the counts should be for days having normal traffic.

This supplementary peg count will be made primarily by clerks from the toll tickets. Mechanical counters or tally slips or both will be provided on the toll switchboard positions for the operator's use in counting all calls which are not ticketed such as Inward ringdown calls and non-ticketed calls handled at the Outward positions. These mechanical counters will be read hourly and the results entered on forms in the same manner as on the local counts.

Forms will also be provided for the use of the clerks in entering the necessary ticket record data as it is taken from the toll tickets. The detailed instruction covering the complete record are too long and complicated to be covered so I will sketch only a few of them in a hasty fashion.

In regard to the Inward traffic, one call will be counted for each Inward call received from another office to a station in the reporting office, and these calls will be counted separately in accordance with the method used by the Inward operator in disposing of them. Requests for through connections which are completed immediately will also be registered on a separate counter. NC, BY, and DA, call orders, and Inward WH party reports will not be registered on counters by the operator as the clerk will receive a record of them from the tickets themselves.

In connection with the Outward traffic, the clerk will tally each Outward call, completed and uncompleted, including calls brought forward from previous days if the toll line was partially or entirely built up on the day of the report. This record will be made by hours and the calls separated into person-to-person, and station-to-station, and further classified as to direct one switch, and two or more switches.

A separate record will be taken of the times, other than the first, it was necessary to build up the toll line in connection with handling each call, in other words, the number of subsequent attempts made on each ticket. There are other classifications which are included in this count, but these few will give a general idea of its completeness.

Now that we have taken the peg count, we must next make proper use of it, but before I go into the so-called summarizing and equating steps, let us first discuss briefly the basis of that work.

We all know that it takes more operator work-time to handle a toll call than a local call. There is also more work involved in handling a local call from a coin box station than from a flat rate station. It takes a toll operator longer to handle a person-to-person call than a station-to-station call, and similarly longer when the call is to a point two switches away than when it is to a direct circuit point.

Obviously if we are going to be able to measure correctly the amount of work performed by each operator and by the office as a whole, we must have some basis or common unit of measurement that we can use in expressing all of these various types of calls.

The Ohio Bell Telephone Co., together with the American Telephone & Telegraph Co., has, after intensive study and detailed stop-watch observations under actual working conditions, found just such a unit of measurement. Since it does express a unit of measurement, it is called very appropriately the unit. To express it in other words, a unit is 15.65 seconds of time.

This is the work done by an A operator in answering a local signal, repeating the called number, and completing the call to the multiple in front of her, including all necessary supervision. These same observations and studies have found that an average skilled operator should handle 230 units per hour. There are 3,600 seconds in an hour, so if we divide 36,000 by 15.65 we will arrive at this figure of 230 units per hour.

The amount of operator work-time, including all necessary supervision which is required to handle every different type of local and toll call, is expressed in terms of this unit. If it takes twice as long to handle a certain type of call as it does to handle this simple A board local multiple call, which is the measuring stick of the unit, the coefficient for this call would, therefore, be 2.00. If it took only three-quarters as much time to handle it the coefficient would be .75. In other words, the number of units of work involved in the handling of one call of a given class is

INCREASING YOUR POWER.

The power of man increases steadily by continuance in one direction. He becomes acquainted with the subject and with his own tools; increases his skill and strength, and learns the favorable moments and favorable accidents.

He is his own apprentice, and more time gives a great addition of power, just as a falling body acquires momentum with every foot of fall.—Emerson.

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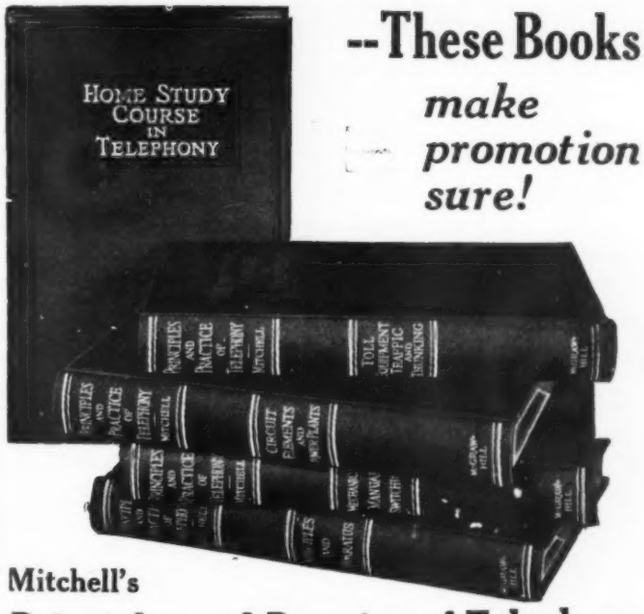

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termed the equating coefficient for that class.

Since 230 units of work may be performed per operator hour, the coefficient for a class of calls of which 115 should be handled per operator hour is two. The unit values corresponding to calls and operations of various kinds have been determined, as I have stated, by countless observations and set up to apply to calls as classified and counted for peg count purposes.

The peg count, therefore, which we have taken must be equated into the terms of units. These peg count results are equated by multiplying the number of calls of each class by its proper coefficient. After this is done for every class of call handled in that office, the total number of units thus arrived at will be added together. The total figure will express the number of units of work handled in that office.

This equating work is carried on by hours of the day, and we will then have the total work performed in that office for the day divided up into the amount performed during each hour.

This detailed study of the traffic is made, as I have already mentioned, from the supplementary peg counts that are taken at infrequent intervals. We know from experience that the characteristics of our traffic remain fairly constant between the periods of these supplementary counts. We, therefore, arrive at a so-called weighted coefficient on the days of the supplementary peg count, and this figure remains in use until the next count is taken.

This general weighted coefficient is arrived at in toll, for example, by dividing the total work units handled in the office during these supplementary peg count days by the number of Outward calls handled. This figure is called the overall unit per out call. The number of work units handled in that office for any succeeding day may be determined by multiplying this overall unit per out call figure by the number of out calls handled.

After determining the amount of work-time performed in an office, the next step is to convert this data into terms of individual operators and draw a schedule which will show the number of operating people required on the switchboard for every period of the day.

In this manner our mathematical computations provide a method whereby we can be sure that we have sufficient operator time available on the switchboard to handle the traffic as it is received. We also know that this force is provided on an economical basis and that we do not have more operators provided than are required to handle the traffic.

We have found that in the absence of a scientific method of arriving at our operator requirements the prevailing tendency is to provide more people than are necessary. Needless to say, this is a vital factor from the management standpoint of earnings and expense.

Traffic Spring House-Cleaning

During the Winter Months Have You Accumulated Rust of Indifference, Carelessness in Your Work, Indolence, and a Crabby Disposition?--Spring Is Appropriate for Inspecting One's Self

By L. A. Dudley,

"Well, here it is April again," remarked an operator, as she looked out of the rest-room window into a little park adjoining the office. "I surely am glad to see spring roll around again. It won't be long now until vacation time arrives. For two weeks, at least, I am going to get away from this daily routine and forget all about telephone offices."

"I think spring is the most wonderful time of year myself," returned Miss Booster, as she joined the other operator in looking out of the window. "We ought to be thankful that we are alive and able to work on a day like this."

"Your remark leads me to believe that you do not approve of my statement about getting away from this daily routine," replied the operator. "Am I to infer that you are opposed to vacations?"

"On the contrary, I believe that everyone should have a vacation once a year," responded Miss Booster. "It does us good to forget work entirely for a couple of weeks. After a vacation in the great out-of-doors, I come home full of pep and anxious to get back on the job. Perhaps for a few days it is hard to get into harness again. but one soon gets adjusted.

"When I spoke about being thankful that we were alive and able to work, I was just thinking of things as they are now—before vacation time. Just see how everything seems to be taking a new interest in life out there in the park! Birds are building new nests, flowers are blooming. Everything seems so fresh and clean. Over at that house in the distance I can see the people engaged at spring house-cleaning. Look at that man beating rugs in the back yard! All creatures seem to be trying to put their houses in order.

"Don't you think it would be a good idea to put ourselves through a spring house-cleaning also? Such a procedure would probably reveal things in us that would surprise us."

"I have always associated spring house-cleaning with cobwebs, dust, and things of a like nature", replied the operator. "Explain to me how you would apply it in a personal sense."

"During the past few months we have, perhaps, accumulated rust of indifference, cobwebs of carelessness, dust of indolence, and the tarnish of a sour or crabby disposition," answered Miss Booster.

"How easy it is for some of us to slip into an 'I should worry!' attitude regarding our work. Indifference is a companion of Failure—and both of them are enemies of Success. Therefore, it behooves us to look closely for any signs of the rust of indifference when we do our spring house-cleaning.

Carelessness is something against which we have to be on guard every hour that we are on duty. Operators seem especially susceptible to this evil. Our work is composed of so many details that we are sometimes tempted to overlook some which may seem little to us. We must remember that no matter how trivial some routine appears to us, there is a reason for it; and the omission or incorrect handling of one item may lead to some serious imperfection in the service.

We, operators, who are experienced are doubly responsible if we are careless. Our laxity is not only reflected in our own work, but in the work of new operators who naturally are inclined to follow our example.

If our operating is sloppy and inaccurate, how can we expect students to become proficient? The supervisor can not detect all errors. It is up to us as individuals to do our work properly. All of the cobwebs of carelessness must be swept out, if our spring house-cleaning is to be a success.

Indolence is nothing more than plain laziness. Now anyone who knows anything about a telephone office is aware that laziness does not belong there. Still, in spite of this fact, laziness sometimes creeps in unless we are ever on the alert against it. We operators must ask ourselves a few questions, and answer them honestly, before we dismiss this point as having nothing to do with us.

Do we pick up our signals as quickly when there is no supervisor in charge to observe our work?

Are we as careful about supervising on our connections.

Are we ever inclined to let other operators do more than their share of the work while we take it easy—just because we know there is no one around to reprimand us?

Haven't we sometimes neglected duties that we were responsible for, just because they involved the expenditure of a little effort?

Most of us would rather take a beating than be guilty of laziness; but we must be sure that the dust of indolence has not crept into our house without our being

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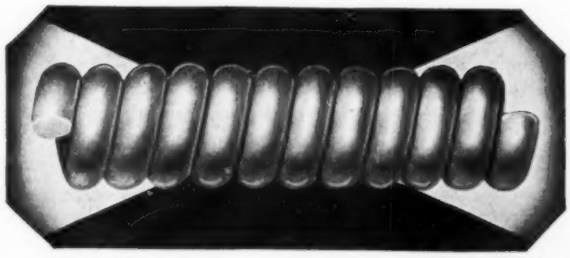

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aware of it. If we discover this defect in ourselves, there is only one thing to do—eliminate it.

One of the worst and most detrimental faults an operator can acquire is the habit of 'crabbing.' What can any of us hope to gain by constant grumbling and fault finding?

If we have any real reason for making a complaint, we should make it to one who is authorized to help us. If our crabbing is nothing more than the expression of our own discontented state of mind, we should make haste in eradicating this condition. If allowed to continue, this habit will result in loss of efficiency and, more important personally, in loss of friends.

It is, therefore, very evident that there is nothing to gain, and everything to lose, by allowing the tarnish of crabbiness or sourness to get a foothold within us. Let us be sure that our spring house-cleaning completely obliterates any evidence of this evil. How much better we all will feel after a thorough job of spring house-cleaning! With our own house spick and span, and everything in order, we can look forward to a happy vacation, conscious of the fact that we really deserve it.

Do you agree with me?"

"I surely do," replied the operator. "My job of spring house-cleaning is starting right now. And I'll do a good job of it."

With the Manufacturers and Jobbers

Line Construction Trucks Present Special Design Problems

By James Holan,

President, American Coach & Body Co., Cleveland, Ohio.

The design of truck bodies for power, light, gas, telephone and other public utility companies generally presents special problems. Not only are such bodies required to fulfill highly-specialized conditions but also their comparatively small number in any given order prevents the adoption of many of the "mass-production" methods of manufacture used in ordinary industrial and commercial trucks. Moreover, it is necessary for the designer to have a thorough practical knowledge of the operations which the truck is to perform.

For trucks destined for overhead and underground line construction, for instance, a powerful winch must be provided for the purpose of unloading drums of lead-sheathed cable, and for pulling this cable through the underground conduits.

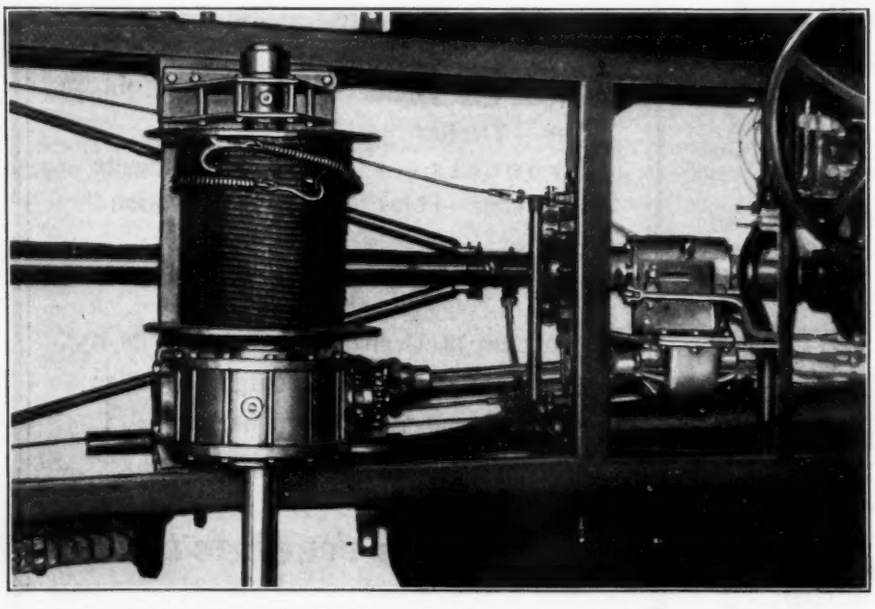
On pole-line construction, the winch must be capable of handling the largest sizes of poles with ease and safety; and may even be called upon to uproot old poles in order to replace them with new ones. This latter service is, of course, exceptionally severe.

The power is applied in a succession of jerks which may run as high as 50,000 pounds each. To withstand such strains over long periods of service demands the strongest construction in the winch and its mechanism as well as in the truck body and chassis.

The power is, of course, supplied from the engine of the truck. To obtain this result, it is necessary to install an extra change-over box in addition to the regular transmission mechanism which drives the truck itself. This "change-over" gear box and its gears we have found necessary to have built to meet our special needs by The Ohio Gear Co., Cleveland, Ohio.

There are two positions of the shift lever: the first connects the engine to the winch, and the second connects it to the regular truck propeller shaft and the rear differential.

On the winch drive side of this gear, the power is transmitted through a silent chain and worm gearing to the drum itself, thus making it impossible for the load to overhaul due to its own weight, and compelling the operator to reverse the drum rotation by means of the regular reverse in the transmission case of the truck.



Top View of Line Construction Truck, Showing Gear Box Which Transmits the Power of the Engine Either to Wheels or to Winch as Desired.

Manufacturers of Clay Conduit for Quarter Century.

The plant of the Shawmut Clay Mfg. Co. at Shawmut, Pa., has been engaged in the manufacture of vitrified salt glazed clay conduit engaged in its manufacture for a quarter century.

In consequence, the plant management has become skilled in every phase of its manufacture through long experience, and the workmen have become trained in their particular tasks and duties through long years of performance. Exhaustive experimentation carried on during the period has developed the product to a point where it commands a prominent place in the trade.

One of the most important facts in connection with the manufacture of clay conduit is the character and quality of the raw material that goes into its make-up. Deep-mined Shawmut fire clay is used at the Shawmut plant. The reputation of this clay with its freedom from impurities has been established over a long period of years, not only in the conduit industry, but in kindred lines as well, it is stated.

The clay is sufficiently porous to permit the free escape of moisture in drying the ware, and withal sufficiently dense and strong to withstand the stress to which the product is subjected in drying and burning, with the result, it is stated, that the ware comes through to the finished state with a minimum of imperfections. As a result, a finished product is produced that is claimed to be unexcelled for density and strength. Numerous tests indicate a moisture absorption sometimes less than 2 per cent.

As an evidence of strength the fact is cited that the claim records of the originating carrier serving this plant, the Pittsburgh, Shawmut & Northern Railroad, show that over a two-year period the breakage claims presented amounted to only $1.16 per carload of material shipped.

The product of this company has a wide distribution. The company is a regular

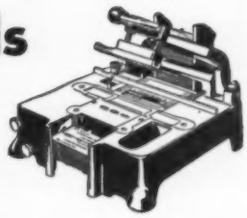
Do You Buy *Batteries* or *Hours of Service?*

COST per *service hour*—not cost per *battery*—is the only way to gauge battery prices. A telephone cell that gives only six or seven months of service is high-priced, no matter what you pay for it. Ray-O-Vac Telephone Batteries cost less because they deliver more hours of service than other batteries. Tests conducted in accordance with U. S. Government standards, as well as records of users, prove that Ray-O-Vacs deliver many hours more actual service than most other makes. And over a period of time, there's a considerable saving in service costs alone. It will pay you to standardize on Ray-O-Vacs. They *last* longer.

FRENCH BATTERY COMPANY
Madison, Wisconsin
General Sales Offices:
20 North Wacker Drive, Chicago, Illinois
Makers also of Flashlight Batteries, Rotomatic and Standard Flashlights and Electric Lanterns

RAY-O-VAC

ADDRESSOGRAPH *does more* . . than handle telephone bills



Small Addressographs operate at speeds from 500 to 1,800 impressions an hour. Print through a ribbon. Prices from $20 to $264.75, f. o. b. Factory.

FOR reducing the expense of imprinting subscribers' bills with name, address, date, rate, etc., hundreds of telephone companies consider Addressograph indispensable.

Yet this is only one of the many operations Addressograph performs. The same economies it effects in your billing, it will also effect in the imprinting of countless forms used in record keeping, collecting, disbursing, routing, repairing, in the stockroom, and in the shop.

Electric and Automatic Addressographs—print through a ribbon—speeds from 2,000 to 12,000 impressions an hour. Electric machines $295 to $870—automatic machines $595 to $12,750, f. o. b. Factory.

And the way Addressograph simplifies the whole job of getting out mailings makes it invaluable in building business and getting more subscribers.

Let the Addressograph representative in your locality show you exactly how with Addressograph you can both reduce expense and build business. There is no obligation.

ADDRESSOGRAPH COMPANY
General Offices: 901 West Van Buren Street, Chicago, U.S.A.
Canadian General Offices:
Addressograph Co., Limited, Toronto, Ontario
European General Offices:
Addressograph, Limited, London N.W. 10
Speedaumat Manufacturing Co., Chicago
Divisions of Addressograph International Corporation
Factories: Chicago, Toronto, London, Berlin, Paris
Sales and service agencies in the principal cities of the world
Copyright 1931, Addressograph Co.

Addressograph
TRADE MARK
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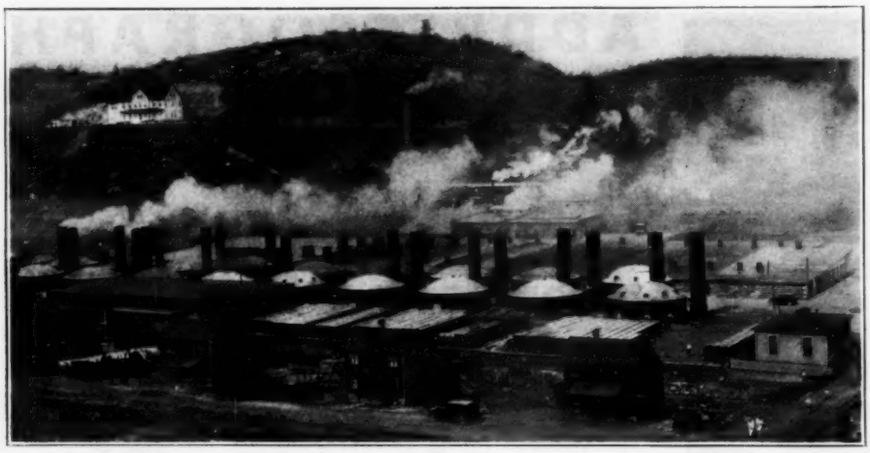
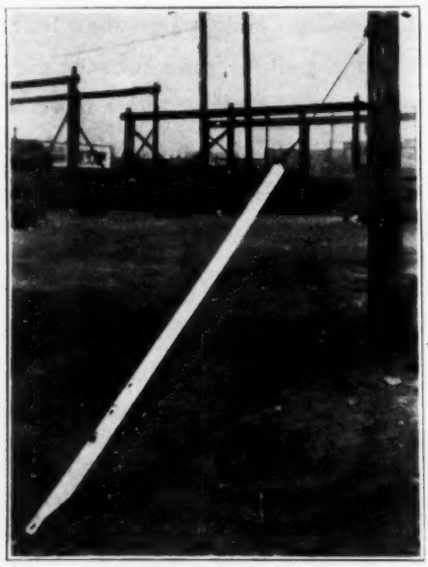


View of Plant of Shawmut Clay Mfg. Co., Shawmut, Pa.

supplier for telephone work on the Bell system throughout the country. It has contributed largely to various subway work in Eastern cities; Shawmut conduit was used in the construction of the vehicular tunnel between New York and New Jersey. Various power companies use Shawmut conduit to house their high tension lines, and traction companies have found it advantageous in their work.

Shawmut conduit was used largely in the construction of the Panama Canal. It has been shipped extensively to Canada for both high and low tension service. Numerous shipments have been made to Buenos Aires and other South American ports. The last and largest shipment exported was to Shanghai, China, on the account of the International Standard Electric Corp.

The company states that ample stocks of all sizes and diameter of bore are available for immediate shipment. In fact, two to three million feet of various sizes are stocked at all times. The plant has an annual capacity of nine million duct feet. A 10-car order, it is stated, can be shipped the same day on which it is received. Plant inspection by customer's representatives is encouraged and solicited.



This New Matthews Guy Guard May Be Installed from the Ground on Any Guy, As the Only Attachment to Make It Secure Is the One Guy Clamp Bolt Near the Ground.

Senior Partner of Iwan Brothers Passes Away at Age of 88.

John Henry Iwan, partner in the firm of Iwan Brothers, of South Bend, Ind., passed away on March 13, at the age of 88 years and five months. Mr. Iwan had lived a long and useful life, having been associated with his brothers in the manufacture of augers for digging pole, post and anchor holes for 54 years.

Unemployment Benefit Plan for Stromberg-Carlson Employes.

With the view to protecting its employes during the many future years in which it intends to serve the Independent telephone operating companies, the Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., has adopted a plan by which workers will receive a large percentage of their wages during idle periods.

Throughout the present winter the company has maintained practically its full working force, although, of course, at somewhat reduced time, but the new plan, which calls for a reserve to be used as a basis for unemployment benefits, is intended to provide for such workers as have to be laid off in the future, a substantial part of their income.

The proposed payment of benefits is not only evidence of Stromberg-Carlson's permanence in the telephone field, as pointed out by newspaper editors commenting on this enterprise, but such a plan, if widely adopted, should serve as a deterrent to industrial and mercantile depressions. It will prevent a destruction of purchasing power among the idle employes, and, with the benefit money in circulation, business slumps will not be so pronounced.

Under the plan, the company will accumulate an "unemployment benefit fund," beginning this year, by setting aside 1 per cent of its total payroll annually until the fund reaches a maximum equal to 5 per cent of its total payroll.

In normal years the entire expense will be borne by the company; there will be no contributions from employes, except that the company reserves the right to declare an emergency in a period of extended unemployment and, during the emergency have the fund supplemented by contributions of 1 per cent from all officials and employes not receiving benefits, the company to contribute during the period an extra amount equal to that received from such employes.

All employes with service of six months or more and receiving less than $50 a week will be eligible to receive unemployment benefits. The benefits will be 60 per cent of the normal pay, with a maximum of $22.50 a week, the period of benefits varying from four weeks for employes with six months' service to 13 weeks for employes of five years' service and over. Unemployment benefits are to be paid after two weeks' unemployment.

Benefits will be paid to part-time workers in case their earnings are less than they would receive in benefits if they were totally unemployed. An employe obtaining temporary work outside will still be eligible for benefits, but in no case are his benefits and temporary earnings plus the benefits, to exceed his normal earnings previous to the layoff.

39TH ANNUAL CONVENTION
IOWA INDEPENDENT TELEPHONE ASSOCIATION
APRIL 7, 8, 9, 1931
HOTEL FORT DES MOINES, DES MOINES, IOWA
STROMBERG-CARLSON TELEPHONE MFG. CO.
Exhibiting the New Lamp Signal Magneto Switchboard in Rooms 307 and 309
MAKE THE EXHIBIT ROOM YOUR HEADQUARTERS
HOME TELEPHONE CO
DES MOINES, IOWA
The Convention will be a success to the extent to which you contribute by your attendance and interest.
We urge you to come.
Carl W. Schafer
Chicago Manager

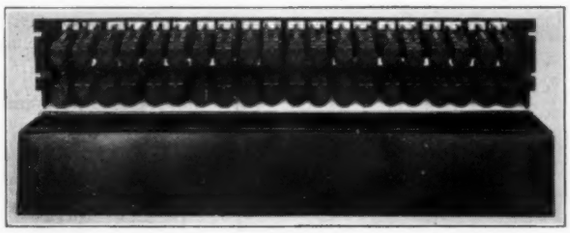
Stromberg-Carlson's Chicago Office Urges Attendance at Iowa Convention.

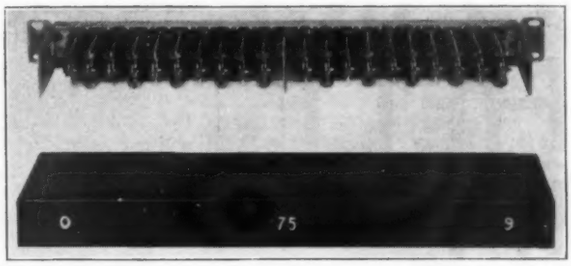
"This plan is an effort to minimize the effect on the employe of future depressions," says W. Roy McCanne, president of the company. "Besides its humaneness, probably the plan's greatest benefit will come from stimulating efforts to prevent future unemployment and retarding the effects of unemployment on business in general."

Personal.

E. A. REINKE, commercial sales manager of the Stromberg-Carlson Telephone Mfg. Co., completed his 30th year of service with that company on March 21.

LINE AND CUT OFF RELAYS





KELLOGG

late No. 2000 type on No. 1008 mounting (per line and cut off relay) $2.50

Western Electric

1-A and 2-A type on No. 737-A mounting (per line and cut off relay) $1.50

Buckeye Telephone and Supply Co.,

COLUMBUS, OHIO

"Cope" **TOOLS** for **UNDERGROUND CABLE INSTALLATION**

Quick Coupling Rods
Screw Coupling Rods
Cable Benders
Cable Racks
Cleaning Tools
Pull in Guides
Manhole Guards
Reel Jacks

T. J. COPE, Inc.

6122 Vine Street, Philadelphia, Pa.
19 So. LaSalle Street, Chicago, Ill.

Note protection at corners
Blake Insulated Staples
Trade Mark
Unequalled for telephone and bell wiring. The fibre insulation prevents troublesome short circuits and grounds.
4 Sizes.
Pat. Nov. 1900
Write for samples
Blake Signal & Mfg. Co.
BOSTON, MASS.

"Stewart" Detecto-Meter

The "STEWART" Detecto-Meter is guaranteed to locate those bad joints that are sure to give trouble in hot weather. One Illinois company cut out two, one bushel crates of bad wire joints all showing resistance. They brought their lines up in transmission, beyond belief.

The Detecto-Meter will also measure resistance of any part of switch-board or telephone. It has more than 100 uses around the telephone plant. It is also a 150-volt voltmeter. Sent on trial. Price $39.00.

Also lineman's Test Sets with detector coil, Cable Testers and Test Cabinets.

STEWART BROTHERS, Ottawa, Ill.

FOUR YEARS' SHELF LIFE

—and still good as new. No change takes place on the inside of a Storm King Duro Powr Telephone Battery excepting when the circuit is closed. Sealed in a seamless, one-piece, heavy zinc cup, neither time, temperature nor atmospheric conditions can reduce the potential energy of these cells. No other Battery is so scientifically engineered or so substantially built. You can have these advantages at no extra cost. Cut your expenses now.

GENERAL DRY BATTERIES
INCORPORATED
CLEVELAND, O.

Makers of all types of dependable Dry Batteries for Radio, Ignition, Flashlight and General Use.

Commissions, Courts and Councils

Discussions and Rulings of Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Cases and Actions of City Councils Relative to Franchises, Rates and Service

Hotel Owners to Get 10 Per Cent of Pay Station Receipts.

Operators of hotels and restaurants in Minnesota will receive a minimum of 10 per cent of the gross receipts of booths and pay stations installed in their places of business, as a result of a ruling issued March 24 by the Minnesota Railroad & Warehouse Commission.

This proceeding was instituted before the commission by the Minnesota Hotel & Restaurant Association, represented by J. A. Jorgensen, E. R. Ruggles and W. H. Pay. The petition requested an investigation with regard to the compensation paid by telephone companies throughout the state to hotels and restaurants in which booths and pay stations are installed, charging that many hotels receive no compensation whatever while others receive commissions ranging from 5 to 50 per cent of the gross receipts of the pay station telephones.

A hearing in this matter was held by the commission on May 13, 1930, and thereafter the commission conducted an investigation throughout the state, on its own motion. As a result the commission found:

"That the operators of hotels and other public places herein involved, at the demand of the public, and in some instances, at the request of the telephone companies and hotel keepers, furnish the telephone companies space in their respective places of business for telephone booths, pay stations, telephones and other telephone appliances, together with janitor, lighting, heating and various other services, and for which accommodations the petitioners herein feel that they should be reasonably compensated for by the telephone companies, and that there is a public demand and necessity for such service.

That, a wide range of compensation now exists on the part of the telephone companies for the payment of said accommodations furnished by the operators of these public places.

That, in numerous cases no compensation whatever is being paid by the telephone companies to the operators of these public places for the accommodations and services so furnished to the public and telephone companies.

That, as the telephone companies and the public are the sole beneficiaries of these accommodations, and services furnished by the operators of these public places, common justice and fairness would seem to require that they should be reasonably compensated therefor."

The commission accordingly issued an order directing that all Minnesota telephone companies be required to pay the operators of hotels and restaurants where telephone booths and pay stations are installed for general public use a just and fair compensation that will be commensurate with the space, accommodations and services furnished by them to the telephone company and public; that the minimum compensation for such services shall be not less than 10 per cent of the gross receipts of the booths and pay stations installed in such places of business.

Changes in Radio Corporation Suit Expected to Be Slight.

The U. S. Department of Justice is not planning any sweeping modifications in its anti-monopoly suit against the Radio Corp. of America, General Electric Co., Westinghouse Electric & Mfg. Co., and other companies associated and affiliated with the RCA in radio manufacture and distribution, although some "slight amendments" may be offered, the Attorney General, William D. Mitchell, announced verbally on March 26.

The suit, now pending before the Federal District Court at Wilmington, Del., is under the supervision of Warren Olney, of San Francisco, Calif., retained by the department as special counsel, the Attorney General said, adding that Judge Olney has suggested some amendments of a minor nature.

One of these amendments, the Attorney General said, involves the inclusion of new companies affiliated with the RCA as defendants in the suit. The suit alleges monopoly in the sale and manufacture of radio apparatus, and contests the legality of the cross-licensing arrangement and "patent pool" of the RCA, General Electric, Westinghouse, and other companies.

Mr. Mitchell said he had no knowledge of reports to the effect that a consent decree would be entered in the radio litigation. It was pointed out at the department that the Federal Trade Commission previously had investigated the RCA organization over a five-year period, but dismissed the case.

City of Chicago Files Suit Against Bell for Five Million.

The praecipe of a suit for $5,000,000 against the Illinois Bell Telephone Co. was filed by Corporation Counsel Samuel Ettelson of Chicago in Superior Court of Cook County on March 30 in behalf of the city of Chicago. The action is to force payment for the company's use of the streets and alleys under the 1907 and 1913 ordinances since May, 1929. The exact amount

of the claim is $4,267,696 and it dates from January 8, 1929, when the last franchise expired, to December 31, 1930. The balance asked is for interest on the debt.

"There is more than $4,200,000 actually due the city at this time for the use of the streets and alleys in which are located the conduits, wires, poles and other equipment of the telephone company," said an announcement made at the city hall.

"Although negotiations have been pending for a new franchise, the telephone company has not been disturbed in the possession and enjoyment of its properties, thus enabling the company to collect from the people many millions of dollars. The company has persistently refused to pay the percentage of its gross receipts."

The statement said the liability of the telephone company was similar to that of a tenant who continued in the possession of the premises after the expiration of his lease.

Mayor Thompson vetoed the new telephone franchise ordinance which was passed by the city council.

Upon being advised of the filing of the suit F. O. Hale, president of the Illinois Bell Telephone Co. said:

"The first advice of this matter we have had was the announcement issued by the mayor's office. Our franchise, under which we formerly made agreed payments to the city, expired January 8, 1929. All of the payments which were required by its provisions were made.

"Until the passage of a new franchise ordinance no payments are due to the city. We have tried to negotiate a new franchise with the city, but thus far efforts have failed."

Power and Telephone Lines Rebuilt, Eliminating Interference.

The Michigan Public Utilities Commission has dismissed the complaint brought against the Northern Michigan Public Service Co., of Traverse City, because electrical interference with the telephone service in Leelanau County has been done away with by rebuilding both electric and telephone lines.

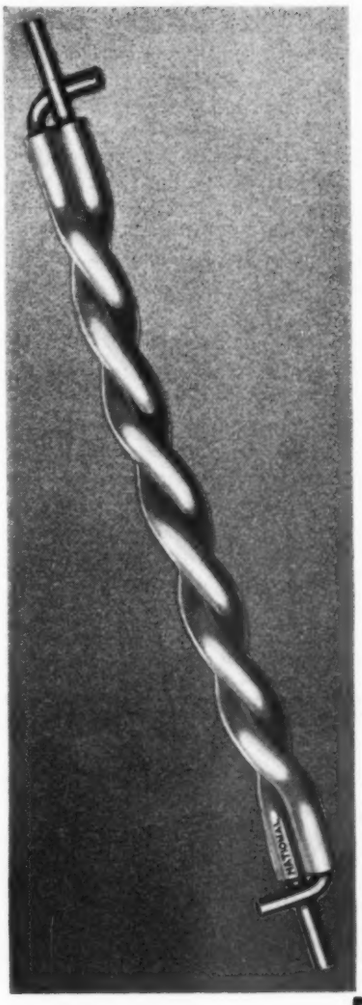
The complaint had been filed by citizens of Leland, by county officials and by the board of supervisors of Leelanau County.

It was asserted that the power lines of the Traverse City corporation interfered with service on the Leland exchange and with the toll service of the Lake Leelanau Telephone Co., operating in Leelanau County.

Municipalities File Briefs in Rate Case of Michigan Company.

Three municipalities, Muskegon, Muskegon Heights and North Muskegon, and the Chamber of Commerce, have filed briefs with the Michigan Public Utilities Commission in connection with the plea of the

OUTSTANDING



The One Best Way to make Joints . . .

The best, quickest and most economical way of doing the important job of making line joints is with Nationals. See if these features of National Splicing Sleeves do not line up with what you know is necessary for the ideal splice. Nationals are a simple, quick, easy method of making the joint. Every National splice is uniform with every other. "Nationals" have great tensile strength—in fact splices made with them are stronger than the wire itself. A joint made with a National Sleeve is air and moisture proof—there can be no corrosion. National splices have a high conductivity. All Nationals are absolutely accurate to size, made from the best grade material.

When it's a splice, make it a National. Write today for samples and prices.

THE NATIONAL TELEPHONE SUPPLY CO.
5100 Superior Avenue
CLEVELAND, OHIO

Michigan Home Telephone Co. for an increase in rates in the Greater Muskegon area. The filing of the briefs followed the appraisal and report made by Gerald Wagner, consulting engineer of Grand Rapids.

Mr. Wagner was engaged by the state to make the appraisal, which was attacked by the telephone company. The telephone company filed its brief about three weeks ago, and the cities in answer contend that the new rates should be based on the appraisal made by Mr. Wagner. The engineer held that the rates requested by the company were exorbitant and proposed a new and much lower schedule.

The Chamber of Commerce in its brief holds that the rate for the cities should include a three-mile area as the base, rather than the city limits as proposed in the Wagner report. The company is agreeable to the enlarged base, while Mr. Wagner on the stand at the time of the hearing said that it would make no material difference in his schedule.

Commission Answers Argument That Rural Rates Be Reduced.

A mass meeting of farmers was recently held in Nelson, Neb., for the purpose of forming a county taxpayers league to be part of a state organization, and devoted to the business of securing a reduction in taxation.

Among the various resolutions was one that the secretary was directed to send to the Nebraska State Railway Commission and which asked that it order a reduction of 25 per cent in the rates on the Nuckolls county system, purchased not long ago by the Lincoln Telephone & Telegraph Co. Prices of farm products are down in Nebraska, and the farmers think that telephone rates should also come down.

This is regarded in commission circles as just another evidence of the lack of information among the people generally of the workings of regulation. On several occasions the commissioners have had to explain that the law is that where a public service corporation is restricted through rates to a limited return on its money, it cannot be denied at all times that same return, and have asked the farmers if they would like to operate under similar limitations.

Minnesota to Investigate St. Paul Program Service Ownership.

Governor Floyd B. Olson of Minnesota has announced that he will ask the attorney general, the Minnesota Railroad & Warehouse Commission and the tax commission to make a "sweeping investigation" of charges that the Program Service Co., a telephone radio broadcasting concern of St. Paul, is a privately-owned corporation within the Tri-State Telephone & Telegraph Co.

The charges, which have been filed with the governor and the Minnesota Railroad & Warehouse Commission, allege that the program company is paying gross earnings of more than $100,000 annually to its officials, who are alleged to be, or to have been, officers of the telephone company.

The attorney general will be asked, the governor said, to determine whether one company can be harbored within another. The tax commission, he said, will be called upon to ascertain whether either company is or should be charged taxes on approximately $40,000 of equipment which, according to the charges filed, is installed on the premises of the telephone company and being used by the program company.

The Minnesota Railroad & Warehouse Commission, Governor Olson said, will be asked to investigate a charge that employes of the telephone company are being used to install and maintain 1,500 radio speakers in service in St. Paul.

In answer to the charges, C. B. Randall, vice-president and general counsel of the Tri-State company, stated that the program company "amply compensates" the telephone company for all services. He said that the program company "provides St. Paul a service that is given nowhere else in the United States."

Summary of Commission Rulings and Schedule of Hearings.

INTERSTATE COMMERCE COMMISSION.

March 31: Hearing in Washington, D. C., before Examiner Davis on application of the Bell Telephone Co. of Pennsylvania for authority to acquire the telephone properties of the Dorseyville Telephone Co. situated in Allegheny County, Pennsylvania.

The territory served by the Dorseyville company is fast becoming a suburban section in the city of Pittsburgh.

March 31: Hearing in Washington, D. C., before Examiner Davis on joint application of the New York Telephone Co. and the West Berne Telephone Co. for authority by the New York company to purchase the properties of the West Berne company.

The territory served by the West Berne company is entirely rural in character and contains two small unincorporated villages, West Berne and Gallupville. There are no telephone stations of the New York company or any other telephone company in service in the territory now served by the West Berne company.

ALABAMA.

March 17: The Standard Telephone & Telegraph Co. granted authority to disconnect its toll lines from the switchboard of the Red Level Telephone Exchange at Red Level effective March 20. The Standard company in its petition charged that the Red Level company had failed to pay the tolls due.

March 17: Petition filed by the Alabama Public Utilities Co., 742 Bankers building, Chicago, Ill., W. Arnold Duncan, president, for permission to acquire telephone properties in Franklin, Winston, Marion, Fayette, Lamar and Pickens counties, Alabama.

ILLINOIS.

March 13: Order approved suspending

(*Please turn to page* 94.)

THE BIG . . . DIFFERENCE

There is one chief difference between the big telephone company and the smaller one. That difference is EXPERT ADVICE. That is where the Public Utilities Department of the United Trust Company fits into your picture. The small telephone industry, through experts of thirty years' experience, may obtain EXPERT ADVICE on advertising, publicity, public relations, engineering, bookkeeping, appraisals, finances and taxes, management and operations. Fill in the coupon below and mail it today. It will bring you our booklet "A Complete Service", which fully describes our various services to the independent telephone company operator.

Public Utilities Department

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ABILENE, KANSAS

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Please send me your booklet: "A Complete Service." I understand that I am under no obligation.

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Position in Firm .....

City ..... State.....

Mentioning TELEPHONY makes it a better paper.

Public Regulation of Overhead Lines at Crossings, Conflicts, or When Involved in Parallels with Power Lines.

General.

Most of the states have passed legislation regulating the requirements governing power and telephone lines at crossings, or when they conflict with or parallel each other.

The state rules set up generally follow closely the safety rules of the Bureau of Standards (the latest book on safety rules is Handbook No. 10 issued April 15, 1927. Cost 60 cents. Address Superintendent of Documents, Government Printing Office, Washington, D. C.)

It is very important that officials of a telephone company familiarize themselves with the regulations prescribed in their state. Failure to do so may result in an expensive damage suit in the event of physical injury to employes or to the public, if traceable to improper construction.

By not following the regulations, a telephone or power company may be ordered to revise or entirely reconstruct a new plant, because of its failure to meet the prescribed requirements. A brief summary of some of the major items with which telephone companies should be concerned follows:

Power-Telephone Crossing Clearances.

The following table indicates the minimum requirements for power and telephone line crossing clearances, as given in the Bureau of Standards Handbook No. 10.

VERTICAL CLEARANCES BETWEEN POWER AND TELEPHONE WIRES

Service drops (0-750 volts)	2 feet
Line wires (0-750 volts)	4 feet
Open power wires (750-7500 volts)	4 feet
Open power wires (7,500 to 50,000 volts)	6 feet

Note: These clearances are based on a temperature of 60° Fahrenheit and no wind.

Where power and telephone lines are in conflict, the minimum clearance in any direction from the conductors of one line to the conductors of the other line is specified by the safety rules as 4 feet where the power voltage is 7,500 volts or less, and 6 feet for lines of over 7,500 volts. By conflict is meant that the lines are so situated that the overturning of one line would cause it to make contact with the other.

Relative Levels.

It is generally stipulated that electric power wires should be over rather than under telephone wires, although instances may arise which make this impossible. Where telephone lines are placed above high voltage power wires, the requirements stipulate that they should conform to the mechanical strength factors specified for power conductors in the same position.

Strength Requirements.

Legislation regulating overhead lines also specifies strength requirements and grades of construction for power and communication lines which are involved in crossings or conflicts.

Six grades of construction are set up and are referred to as *A, B, C, D, E,* and *N*. By reference to the tables given in the Bureau of Standards handbook, the grade of construction which should be used for any given situation can be determined.

Rules Governing Parallels.

In addition to prescribing rules governing the construction and maintenance of power and telephone circuits so as to reduce physical hazards to a minimum, many of the states have set up rules governing the requirements which should be followed in order to minimize inductive interference due to paralleling power and telephone lines.

These rules are, for the most part, based on the results of the inductive interference investigation in California which was completed in 1919. The rules cover such items as the following:

Separation of Lines: It is generally specified that power and telephone lines should, if possible, seek non-paralleling routes; where this is impracticable, that they maintain as great separation as possible. The need for uniformity in spacing throughout a parallel is usually stressed.

Conductor Arrangement: The necessity for uniform configuration of power conductors throughout a parallel is also pointed out. A change in configuration changes the magnitude and often the phase of the induced noise currents in a paralleling telephone circuit, and unless it occurs at a balanced point in the telephone and power transposition scheme, is very objectionable.

Transpositions: It is generally recognized, and regulations usually stipulate, that the power and telephone companies confer and agree on a suitable transposition scheme for both classes of circuits in order to keep induced noise at a low value. On all new power line construction, telephone companies should cooperate with power companies in seeing that the power lines are transposed so as to fit the existing or proposed telephone transposition scheme. It is important that power lines be transposed outside of parallels, as well as in the parallel, in order to keep the power line balanced to ground.

The unbalance, though set up in an untransposed portion of line outside the parallel, will be effective in inducing noise in the parallel.

Power barrels of three-phase lines should be preferably kept at a maximum of three miles in length, although six-mile barrels are satisfactory for power lines outside of the parallel if there is little possibility of a future parallel being created.

Balance of Telephone and Power Lines.

State regulations usually specify that power and telephone lines be kept well balanced so that the inductive influence of the power line be kept as low as possible and that the inductive susceptibility of the telephone line be kept at a minimum. The principal factors which they enumerate as requiring consideration are:

1. FOR POWER LINES: Metallic single phase taps unbalance the three-phase line to which they are connected and should be kept at a minimum.
2. Transformer connections in which a grounded star connection is made to the line wires should be avoided.
3. If both primary and secondary windings of a transformer bank are Y-connected, then delta-connected tertiary windings should be provided to reduce third harmonics.
4. Generating equipment having good wave form should be used.
5. Single-phase loads should be as equally distributed as possible on polyphase systems.
6. The transmission system should be maintained free from leaks to grounds.
7. Transmission lines should be operated so that severe induction does not take place during switching operations. This usually involves switching arrangements which open all conductors simultaneously.
1. FOR TELEPHONE LINES: Telephone lines should be kept electrically balanced by means of transpositions and by elimination of bad splices, leaks to ground or inherent circuit unbalance.
2. Signalling systems in which the switchboard drop is connected from one side of the line to ground are particularly bad from an inductive standpoint. This arrangement unbalances the line on all calls in which a connection is not established through the switchboard.
3. Divided ringing systems, in which the station ringers are placed from one side of the line to ground are also objectionable, especially where the power line has considerable unbalance to ground, or where extensive parallels exist with no transposition in the power line. It should be noted that either the "silent signaling system" or the "divided ringing" system will work very satisfactorily where power lines are kept well balanced, and longitudinal induction kept low by means of power barrels throughout the parallel.

NOTE: This data sheet was not intended to supply any details or specific information but rather to point out a number of general facts governing power and telephone circuits involved in parallels, crossing and conflicts.

Every telephone company should procure, if it does not already have, a copy of the state rules and regulations governing power line and telephone overhead construction, also a copy of the Bureau of Standards Handbook previously referred to. It is better to be safe than sorry, and with the tendency to use higher power voltages, and more lines being built each year, the problem is a most important one.

MANUFACTURERS' LITERATURE

The following is a brief description of recently published bulletins, catalogs, etc. If you are interested in obtaining copies address your request to the manufacturer.

Notices Not Previously Published

ADDRESSING MACHINES

"Beyond the Counter—The ABC of Direct Mail Advertising," a thirty-six-page booklet representing a comprehensive study of direct mail, showing its value as an aid in increasing sales. Contains many interesting illustrations and a description of several styles of Addressographs. **Addressograph Company, 901 W. Van Buren St., Chicago, Ill.**

BATTERY CHARGERS

An eight-page pamphlet giving full information regarding Tungar battery chargers for telephone service. Profusely illustrated and contains complete specifications of various models and styles. **General Electric Company, Merchandise Department, Bridgeport, Conn.**

BILLING MACHINES

"Telephone Billing—Combined Toll and Subscribers' Billing for the Smaller Telephone Offices," a four-page bulletin, amply illustrated, of particular interest to the smaller telephone exchanges. **Burroughs Adding Machine Co., Detroit, Mich.**

CEDAR POLES

A four-page illustrated bulletin giving full details regarding Creo-Stain and the V-C method of roofing. **Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.**

When writing please mention TELEPHONY

CREOSOTED PINE POLES

A ten-page pamphlet having reference to pole line design. **American Creosoting Company, Louisville, Ky.**

DRY BATTERIES

Form A 501 gives specifications for No. 6 telephone dry batteries. **French Battery Co., 20 No. Wacker Drive, Chicago, Ill.**

ELECTRICAL WIRES AND CABLES

A 134-page catalog and handbook on wiring systems containing some very informative tables and is thoroughly illustrated. **American Steel & Wire Co., 208 So. LaSalle St., Chicago, Ill.**

LINE CONSTRUCTION EQUIPMENT

A new catalog giving full specifications on winches, derricks, trailers, power take-offs, earth boring machines and line construction trucks. Thoroughly illustrative and descriptive. **Four Wheel Drive Auto Co., Clintonville, Wis.**

OPEN WIRE

A ten-page illustrated pamphlet giving complete specifications and prices on telephone and telegraph wire and steel strand. Also contains a useful section on Angle Guying and Dead Ending. **American Steel & Wire Co., 208 So. LaSalle St., Chicago, Ill.**

SOLDERING

A thirty-six page booklet entitled "Facts on Soldering." Gives reasons for soldering, application of solder and flux and describes most satisfactory practices. Amply illustrated. **Kester Solder Company, 4201 Wrightwood Ave., Chicago, Ill.**

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STORAGE BATTERY EQUIPMENT

"Exide Batteries (Stationary Types) for Various Power Applications" is the title of an eight-page illustrated pamphlet giving a full description of Exide Batteries, their capacities and specifications. This is referred to as Folder Form 3266. **Electric Storage Battery Company, 19th and Allegheny Ave., Philadelphia, Pa.**

WIRE CLEARANCE

"Tree Trimming for Wire Clearance," a sixteen-page illustrated booklet giving full information regarding the need of periodic and efficient tree pruning. **The F. A. Bartlett Tree Expert Company, Stamford, Conn.**

WRENCHES

Illustrated circular describing Crestoloy steel as used in the manufacture of Crescent wrenches. **Crescent Tool Company, Jamestown, N. Y.**

Notices Previously Published

GUY GUARDS

Attractively illustrated pamphlet describing outstanding features and installation details of new Matthews Guy Guard. **W. N. Matthews Corp., 3700 Forest Park Blvd., St. Louis, Mo.**

PLIERS

An illustrated catalog of 36 pages giving detailed specifications of many different styles and sizes of Vacuum Grip Pliers. **Forged Steel Products Co., Newport, Pa.**

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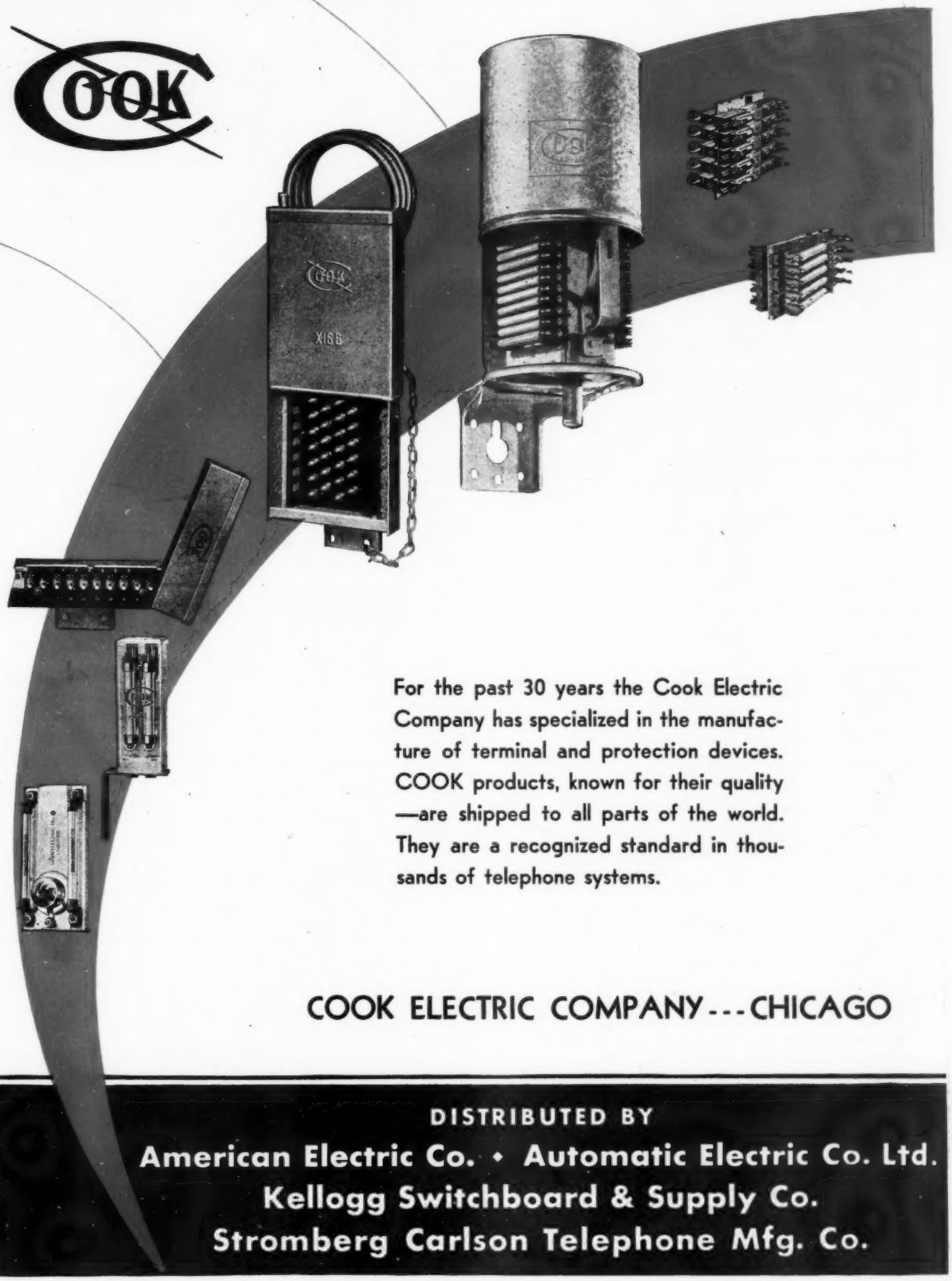

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WHAT THE COURTS AND COMMISSIONS ARE DOING

(*Continued from page* 90.)

until July 18 proposed advanced rates for telephone service by the Assumption Mutual Telephone Co.

The suspension was made pending a hearing by the commission concerning the reasonableness of the new rates proposed by the Assumption Mutual company.

March 17: The commission denied the petition of the city of Princeton requesting a rehearing of the rate case affecting Princeton and 10 other Bureau County exchanges of the Illinois Allied Telephone Co.

The Illinois Allied company had previously been authorized to increase rates at certain exchanges effective March 9.

March 17: Southeast Missouri Telephone Co.'s rate schedule I. C. C. 1, applicable to properties acquired by purchase from the Alexander County Telephone Co., effective March 18, 1931, filed and no action taken.

March 18: Proposed rates for telephone service rendered by the Illinois Commercial Telephone Co. in Hudson, McLean County, suspended until July 12, 1931, pending a hearing concerning reasonableness of the new rates proposed by the company.

March 19: Order approved suspending until September 14, 1931, proposed rates for telephone service rendered by the Illinois Commercial Telephone Co. in Astoria, Fulton County, pending hearing as to reasonableness of the new rates proposed by the company.

May 13: Continued hearing on proposed advance in rates for telephone service in Chatsworth, county of Livingston, stated in rate schedule I. C. C. No. 2 of the Illinois Commercial Telephone Co.

The Illinois Commercial company filed a motion with the commission stating it was unable to proceed with the hearing on March 25 and asked for a continuance.

Indiana.

March 18: Petition filed by the Pulaski County Telephone Corp. for an increase in rates for service rendered in Winamac, Francesville, Medaryville, Kewanna and Monterey.

March 27: Motion filed by the Fountain Telephone Corp. to dismiss the petition of the Foster Co-Operative Telephone Co. to be declared a utility. The motion was reported to be based on lack of commission jurisdiction and authority.

The Foster Co-operative company would operate in Fountain company territory. The motion was filed by Attorney John Powell.

Michigan.

March 18: Approval granted rate increases by the Leighton Telephone Co., operating the Corning exchange in Allegan County.

March 18: The request of Eugene Wheeler and other subscribers of the Dansville Telephone Co., who sought permission to disconnect their lines and to secure service through the Rural Telephone Co., of Waterloo, at Stockbridge, denied.

March 18: Application for a certificate of public necessity by the Citizens Telephone Co. of Berrien County, denied. The company asked for a permit to operate telephone facilities in Chickaming township, Berrien county. The territory is now served by the East Shore Telephone Co.

March 18: Case dismissed of the East Hamilton & North Grout Roadway Telephone Co.

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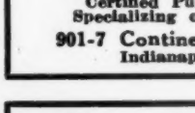
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March 18: Complaint against the Northern Michigan Public Service Co., of Traverse City, dismissed because electrical interference with the telephone service in Leelanau County has been done away with by rebuilding both electric and telephone lines.

The complaint had been filed by citizens of Leland, by county officials and by the board of supervisors of Leelanau County. It had been asserted that the power lines of the Traverse City corporation interfered with service on the Leland exchange and with the toll service of the Lake Leelanau Telephone Co.

MINNESOTA.

March 14: In the matter of a rehearing on application of the Pequot Rural Telephone Co. for authority to change its schedule of telephone rates at Pequot; it was found that the books of the company had been kept very unsatisfactorily and not according to commission requirements. The manager of the company was ordered to install and maintain records as prescribed in the uniform system of accounts for telephone companys.

After considerable investigation a schedule of rates and charges were approved, effective April 1.

March 24: Order issued, effective April 1, directing that all telephone companies, operating in the state of Minnesota be required to pay the operators of hotels and restaurants where telephone booths and pay stations are installed for general public use, a just and fair compensation that will be commensurate with the space, accommodations and services furnished by them to the telephone company and the public; that the minimum compensation to be paid to the operators of these public places for such accommodations by the telephone companies, shall be not less than 10 per cent of the gross receipts of the booths and pay stations installed in such places of business

This order followed a hearing on the peition of J. A. Jorgensen, E. R. Ruggles, Roy E. Dunn and W. H. Pay, a committee representing the Minnesota Hotel & Restaurant Association.

MISSOURI.

March 14: Application of the United Telephone Co. for authority to make certain changes in its rates for telephone service at Schell City, approved with certain changes.

March 19: In regard to complaint of the Missouri Public Service Commission vs. the Central Missouri Telephone Co.; company ordered to rebuild and repair rural lines connected with Rayville exchange.

March 23: Approval given application of the North Central Telephone Co. for permission to abandon its exchange at Forbes Farm, Taskee Station.

NEW JERSEY.

March 18: Protest filed by the Somerville borough council charging that the New Jersey Bell Telephone Co., after being granted permission in 1925 to increase its rates in Somerville from 25 to 30 per cent on all classes of service excepting four-party business lines, thereafter discontinued the four-party business service arbitrarily. This, the council's protest sets forth, compelled erstwhile four-party line subscribers, who made up more than 50 per cent of users of business telephones, to stand increases of from 75 to over 100 per cent, jumping the rate they were forced to pay from $2.50 to $5.25.

OHIO.

April 6: Hearing on rate case of Warren Telephone Co., postponed to this date from March 25.

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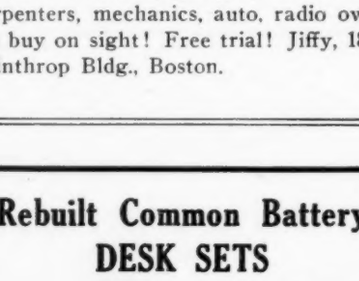

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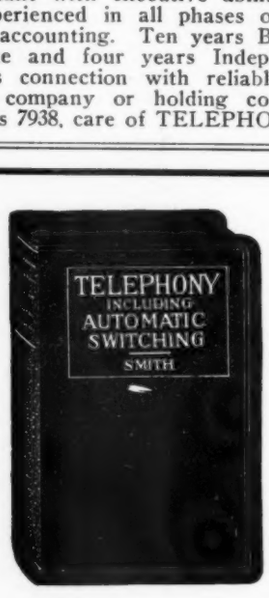

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